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ABSTRACT

This document contains teacher's materials for industrial technology education courses in four instructional clusters (communication technology; construction technology; manufacturing technology; and energy, power, and transportation technology) taught in grades 7-10 in South Carolina. Introductory materials state the mission and goals of industrial technology, outline the clusters and instructional units of each, describe recommended instructional formats for grades 7-8 and 9-10, diagram the South Carolina plan for technology education, and explain how to use the materials. The teachers' guide for each cluster contains: (1) a list of units and topics with recommended instructional time for each; and (2) outlines for each unit that describe: the unit's major concept; topics; behavioral objectives; core instructional activities; advanced instructional activities; evaluation activities; tools, equipment and materials needed; vocabulary that should be included and reinforced in the instruction; and references. A separate resource section lists names and addresses of sources for audiovisual and print materials on space technology and technological careers. A recommended equipment list for middle/junior high school industrial technology education provides the following information for each item: quantity; specifications; estimated unit cost; and estimated total cost. (CML)

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SOUTH CAROLINA
GUIDE
FOR
INDUSTRIAL TECHNOLOGY EDUCATION

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Clemson, South Carolina 29631

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FOREWORD

Technology is changing the way we live, learn and work. If we are to keep up with technology and control it, we need to understand it. This instructional guide for Industrial Technology Education is one attempt to meet this challenge in the public schools in South Carolina. This guide was developed and field tested by South Carolina Industrial Technology instructors, Clemson University faculty and State Staff with the purpose of setting a new direction for technology education in grades 7 through 10 in South Carolina.

The content of the Industrial Technology Education instructional guide has been drawn from the four generally recognized systems of technology of communications, construction, manufacturing and transportation. The South Carolina Department of Education, Office of Vocational Education is committed to the implementation of this curriculum and to assisting administrators and teachers as they develop and maintain quality instructional programs in all areas of technology education.

Charles G. Moore, State Supervisor
Trade and Industrial Education

INDUSTRIAL TECHNOLOGY EDUCATION
MISSION STATEMENT

The mission of Industrial Technology Education is to prepare the student to participate in and adapt to a dynamic technological society. The curriculum provides application and immediate relevance to principles of math, science and other subject areas. Industrial Technology focuses on the development and application of industrial technologies and develops students who are self-learners and problem solvers, as well as self-reliant and productive members of society.

GOAL STATEMENTS

Consistent with the student's abilities, interests, and needs, industrial technology education will:

1. Prepare students to work with technical systems within the areas of communication, production, transportation and energy/power utilization.
2. Assist students in assessing and preparing for current and emerging occupations.
3. Enhance student mastery of the basics through application of math, science, social studies, communications and computer literacy.
4. Develop student awareness and skill through the safe utilization of tools, materials, and equipment.
5. Provide students with a foundation in entrepreneurship, economics, and business relationships.
6. Assist students in becoming independent learners and creative problem solvers who possess self-confidence and lifelong learning attitudes.
7. Establish beliefs and values based upon the impact of industry and technology and how it alters environments.
8. Explore and develop human potential related to responsible roles in a technological society.

INDUSTRIAL TECHNOLOGY EDUCATION
CLUSTERS AND UNITS

Industrial Technology Education is an instructional program that provides hands-on exploratory experiences and insights into technology and career opportunities. The major objective of Industrial Technology Education is to provide students with a foundation in safety, the use of tools, equipment and materials, and familiarity with occupationally specific nomenclature. The program also serves as a feeder program to enable students to make informed decisions as to their interest and compatibility with occupational areas requiring technological knowledge and competence. It is designed to provide manipulative operations and experiments with tools, materials, processes, and products directly related to the following four instructional clusters.

1. Communication Technology

The communication and media technology curriculum is designed to provide students with an opportunity to become acquainted with fundamentals involved with graphic, audio visual and line communications. Included is occupational information related to this important part of our industrial and technological society. Learning experiences include: drawing and sketching, letterpress printing, photography, screen printing, radio and television production, and data transmission. Suggested instructional units are:

Audio Visual Systems
Basic Drafting
Computer Aided Drafting
Computer Utilization
Graphic Communications
Basic Photography

2. Construction Technology

The construction technology cluster curriculum is designed to give students a better understanding of construction technology. The program provides construction concepts and experiences with the tools, materials, and processes used in construction activities, management, and production practices in the construction industry. The suggested instructional units are:

Design
Preparing to Build
Masonry
Wood Frame Construction
Electrical Wiring
Plumbing

3. Manufacturing Technology

Manufacturing technology is a study of skills and information used in manufacturing processes. It provides learning experiences that fulfill the growing demand for educational programs which deal with important industrial and manufacturing concepts. The suggested instructional units are:

Research and Design
Materials and Processes
Casting and Molding
Mass Production
Assembling
Computer-Aided Manufacturing
Industrial Production Management

4. Energy, Power and Transportation Technology

This curriculum is designed to acquaint students with the transportation industry dealing with power and energy utilization. Energy is classified as chemical, mechanical, nuclear, radiant and thermal. The suggested instructional units and activities in this program are:

The Basics and Principles of Transportation
Introduction to Energy and Power
Basic Engine Principles and Design
Mechanical Systems
Fluid Power Systems
Electrical Systems
Combined Systems
Computerized Numerical Control
Solar Energy
Basic Engine Principles and Design
Space Transportation
Water Transportation

INDUSTRIAL TECHNOLOGY EDUCATION
RECOMMENDED INSTRUCTIONAL FORMAT

The Industrial Technology Education Curriculum Guide allows flexible instructional activities at different grade levels and for varying lengths of time.

The following instructional formats are suggested:

Grades 7-8 **Introduction to Industrial Technology**:
Introduction to all clusters is recommended

Communication Technology
Construction Technology
Manufacturing Technology
Energy/Power and Transportation Technology

Grades 9-10 **Communication Technology**:
Elective courses one or two semesters in length

Graphic Communication Systems
Electronics Communication Systems
Media Communication Systems
Computer Communication Systems
Audio Visual Communication Systems

Construction Technology:
Elective courses one or two semesters in length

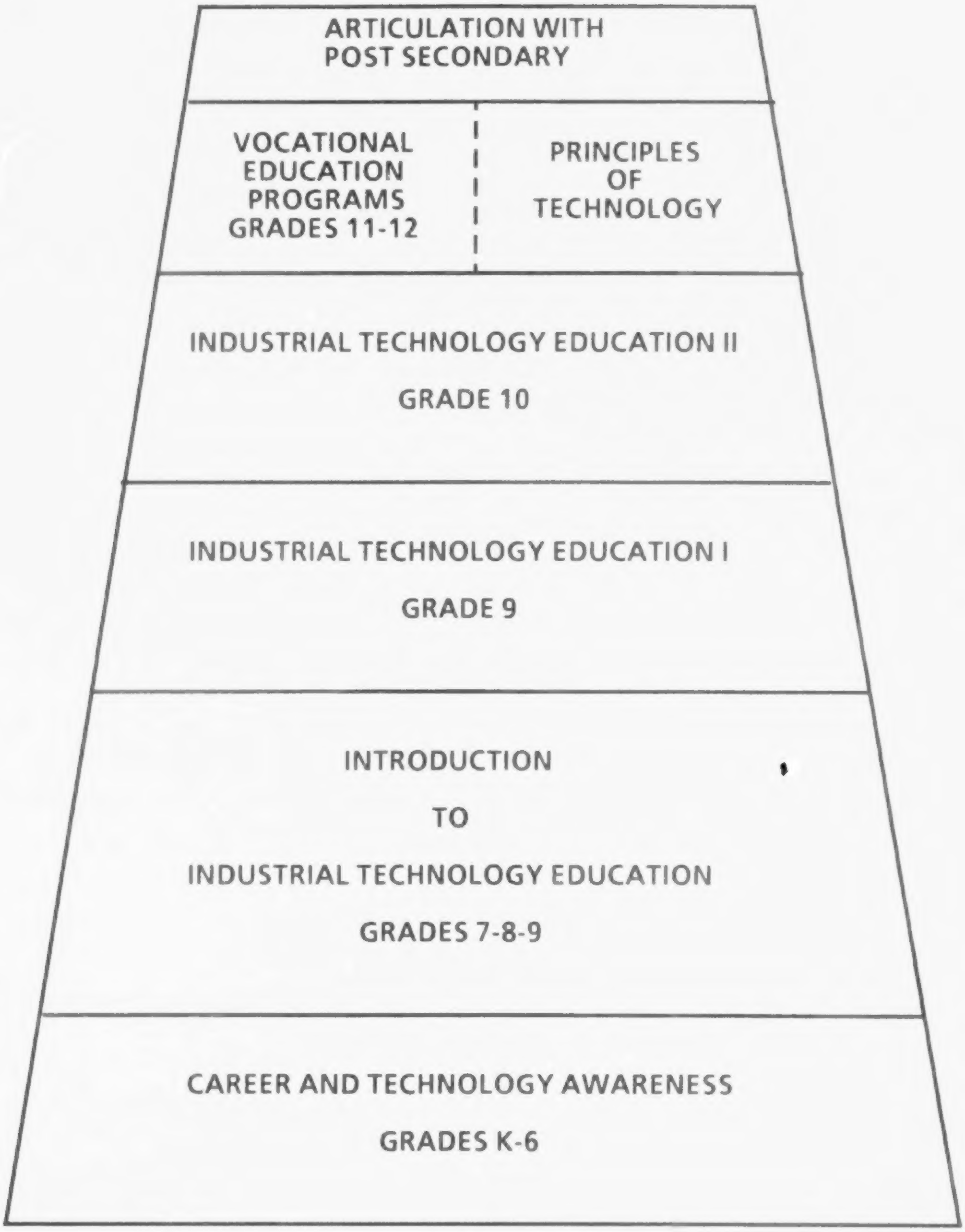
Construction Planning and Design
Constructing and Servicing Structures
Electro/Mechanical Systems and Services

Manufacturing Technology:
Elective courses one or two semesters in length

Manufacturing Materials and Processes
Designing Products for Manufacture
Manufacturing Production System
Computer-Aided Manufacturing
Industrial Production Management

Energy/Power and Transportation Technology
Elective courses one or two semesters in length

Introduction to Energy and Power Systems
Technical Elements Transportation
Planning and Designing Transportation Systems
Human and Goods Transportation Systems


ARTICULATION WITH POST SECONDARY
VOCATIONAL EDUCATION PROGRAMS GRADES 11-12
PRINCIPLES OF TECHNOLOGY
INDUSTRIAL TECHNOLOGY EDUCATION II
GRADE 10
INDUSTRIAL TECHNOLOGY EDUCATION I
GRADE 9
INTRODUCTION
TO
INDUSTRIAL TECHNOLOGY EDUCATION
GRADES 7-8-9
CAREER AND TECHNOLOGY AWARENESS
GRADES K-6

THE SOUTH CAROLINA PLAN FOR TECHNOLOGY EDUCATION

HOW TO USE THE INDUSTRIAL TECHNOLOGY EDUCATION CURRICULUM GUIDE

Each cluster contains a table of contents that displays a chart indicating the hours per unit recommended for 9 (45 hours), 18 (90 hours), and 36 (180 hours) week courses. Each hour indicated on the units represents a 50 to 55 minute class period. Note that some 9 and 18 week units contain fewer than the maximum hours recommended for a complete unit. Thus, the teacher should select the most educationally sound activities that can be completed in the allotted time and that also contribute to the entire 9 or 18 week course. All units contain ample classroom core, advanced instruction, and student activities for the time allotted to each. The teacher must select unit activities that are appropriate for his or her learning situation. It is recommended that activities involving a significant degree of psychomotor application be given priority consideration.

I. **TITLE:**
Each unit is identified by a Major Title and Unit Title. The course plan is organized in a sequence that lends a logical starting and ending point.

II. **MAJOR CONCEPT AND TOPICS:**
Each unit contains a Major Concept. This statement is central to the intent of the lesson. Beneath the Major Concept are related Topics that provide guidance for enhancing student understanding of the major concept.

III. **BEHAVIORAL OBJECTIVES:**
All objectives are written in behavioral terms and can be achieved through the recommended learning activities. The teacher should devise evaluative methods to measure the attainment of each objective.

IV. **INSTRUCTIONAL ACTIVITIES:**
Unit activities are indicated as "Core" and "Advanced". The core activities are designed for ITE-I level instruction: the advanced activities for the ITE-II level. However, it is understood that activities from either group may be selected depending on the ability and maturity of particular students. Also, there is considerable opportunity for teachers and students to expand any of the activities in an educationally beneficial manner.

V. **EVALUATION:**
Lessons will be evaluated by teacher made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

VI. **TOOLS, EQUIPMENT AND MATERIALS:**
Standard common equipment and materials have not been identified. Special items have. The teacher should examine the activities to be used and prepare a detailed list of items that may be needed for particular lessons. Many of the items, such as tape, scissors, and paper might be obtained from school supplies; other items, such as plastic pipe, cement, or corks will have to be obtained from other local sources. (The major equipment items are also listed on the recommended Industrial Technology Education Equipment list developed by the Office of Vocational Education.

VII. APPLICATION OF TERMS:

This list of words has been drawn from the learning activities and relates to the Major Concept. The terms should be included in the instruction and their meaning and application reinforced at every opportunity.

VIII. REFERENCES:

Selected references have been identified for each unit. In many instances, references will provide sources of equipment or software referred to in the Unit Activities.

UNITS IN COMMUNICATION TECHNOLOGY
RECOMMENDED INSTRUCTIONAL TIME

	9 WKS	18 WKS	36 WKS
1. Introduction/Overview of Communication Technology	1	2	2
2. Introduction to Drafting & Design in Communication Technology	1	2	2
2.1 Symbols and Lettering	1	2	5
2.2 Scales Used to Communicate Size	1	2	2
2.3 Freehand Sketching	1	3	3
2.4 The Geometry of Technical Drawing	1	2	3
2.5 Multiview Drawings	1	2	5
2.6 Dimensioning Size and Location		1	5
2.7 Pictorial Drawings	2	3	5
2.8 Computer Aided Drafting (CAD)		2	5
3. Introduction to Graphic Communications	1	1	2
3.1 Safety	1	1	2
3.2 Types of Graphic Communications	1	2	4
3.3 Layout and Design	1	2	7
3.4 Relief Printing	2	3	7
3.5 Gravure Printing		1	3
3.6 Screen Printing	3	5	15
3.7 Planographic Printing	1	3	7
3.8 Bindery and Finishing	2	2	5
4. Introduction to Photographic Technology	1	1	3
4.1 The Camera: Application of Basic Photographic Principles	2	3	3
4.2 Operating the 35mm Single Lens Reflex Camera		2	5
4.3 Composition	1	1	2
4.4 Exposure	2	2	4
4.5 Properties of Film and Film Development	1	2	4
4.6 Contact Printing and Enlarging	3	4	5
4.7 Applications of Advanced Photographic Technology		2	4
5. Introduction to Electronic Communications	1	1	2
5.1 One Way Telecommunication Systems	2	2	4
5.2 Two Way Telecommunication Systems	2	2	4
5.3 Fiber Optics in Communications	1	3	4
5.4 Satellites in Communications	1	1	2
5.5 Lasers in Communications	1	2	4
5.6 Microwave Communications		1	2
5.7 Introduction to Computers	2	3	3
5.8 Computer Software and Hardware	2	3	7
5.9 Computer Theory	1	4	10
5.10 Computer Applications and Impacts	1	2	5
5.11 Audio/Video Production Planning		3	5
5.12 Audio/Video Production		4	7
5.13 Impact and Careers in Audio-Video Communications		1	2
TOTAL HOURS	45	90	180

NOTES

REFERENCE: 1

MAJOR TITLE: Communication Technology

UNIT TITLE: Introduction/Overview of Communication Technology

MAJOR CONCEPT: Industrial Communications Technology involves many kinds of equipment and methods to convey and share thoughts and ideas.

TOPICS:

1. Five elements of communication (sender, channel, message, receiver, feedback)
2. Communication Technology (tools, materials, processes)
3. Communication Systems (input, process, output, feedback)
4. Types of Communication (i.e. Drafting and Design, Graphic Communication, Photographic Communication, Electronic Communication)
5. Impact of Communication Technology

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define communication technology and discuss the impact of modern communication on society.
2. List the five basic elements of the communication process.
3. Identify the three basic types of communication systems.
4. Describe a communication system by its input, process, output, and feedback, and provide at least one practical example.

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify three methods of communicating the message in each of the following forms: audio, visual, and audio/visual.
2. Make a list of all the communication systems you come in contact with during the course of a day.
3. Break down the following communication systems into input, process, output, and feedback:
   a. Radio b. Television c. Telephone d. Telegraph e. Teletype
4. Define communication technology as the tools, materials and processes that people use to enhance their abilities to communicate.
5. Draw a block diagram of a communication system showing the five basic elements of sender, message, channel, receiver and feedback and discuss how these elements work together to communicate a message.
6. Identify methods in which technology is used to help people communicate.
7. Explain the basic history and development of at least one communication device and explain how the particular device has changed the way people communicate and/or what it would be like if we did not have the device.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Identify recent developments in communication technology.
2. Discuss the impact of a communication device and construct a model from inexpensive materials from around the house or the lab.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Overhead projector w/screen
Chalkboard
VCR system w/camera

MATERIALS/CORE:

Video tapes
Paper
Pencil

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATION OF TERMS:

Sender
Message
Feedback
Communication Technology
Visual Communication System
Process
Noise
Channel
Receiver
Interference
Communication System
Input
Output
Audio Communication System

REFERENCES:

Communication Technology Curriculum Guide., Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Research and Development Section, 100 North First Street, Springfield, Illinois 62777, 1984.

Havenstein, A. D. and Bachmeyer, S. A., The World of Communications Visual Media, Bloomington, Illinois: McKnight Publishing Co., 1974.

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich, 1986.

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REFERENCE: 2

MAJOR TITLE: Communication Technology

UNIT TITLE: Introduction to Drafting & Design in Communication Technology

MAJOR CONCEPT: Drafting is an essential part of industrial communication.

TOPICS:
1. Language of industry
2. Career opportunities
3. Computers in the field of drafting

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Describe how drafting communicates ideas.
2. Describe various drafting careers.
3. Explain the impact of computers on the profession of drafting.

CORE INSTRUCTIONAL ACTIVITIES:
1. Discuss how drafting communicates ideas in industry.
2. Observe a teacher demonstration on drafting machines and Computer Aided Drafting (CAD) systems.
3. Discuss how computers have changed drafting.
4. Research and explain two career opportunities in drafting.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Write a paper about a drafting career.
2. Identify an example of Computer Aided Drafting (CAD).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer Aided Drafting (CAD) System
Standard drafting equipment

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

None

MATERIALS/ADVANCED:

None

APPLICATION OF TERMS:

Drafting
Technical Illustrator
Senior Drafter
Mechanical Drafting
Checker
Drafter Trainees
American National Standard Institute
Detail Drafting
Computer Aided Drafting (CAD)
Design Drafter
Map Drafter
Architectural Drafting
Electrical Drafting

REFERENCES:

Bertoline, Gary R., CAD Applications, Mechanical, Albany, N.Y.: Delmar Publishers, Inc., 1986.

Goetsch, David L., CAD Applications Architectural, Albany N.Y.: Delmar Publishers, Inc., 1986.

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

Spencer, Henry, and Dygdon, John, Basic Technical Drawing, Riverside, N.J.: Macmillan Publishing Co., Inc., 1980.

REFERENCE: 2.1

MAJOR TITLE: Communication Technology

UNIT TITLE: Symbols and Lettering

MAJOR CONCEPTS: Symbols, lines, and letters are the building blocks of drafting.

TOPICS:

1. Symbols
   - 1.1 Alphabet of lines
   - 1.2 Finish marks
2. Lettering
3. Tools of drafting

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify drafting symbols and lines.
2. Identify the tools used to prepare a technical drawing.
3. Demonstrate single-stroke vertical gothic freehand lettering.

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify drafting symbols displayed on the Cathode Ray Tube (CRT) of a Computer Aided Drafting (CAD) system or on teacher prepared handouts.
2. Match the name of the drafting tool with the tool shown by the teacher.
3. Freehand letter a teacher assigned exercise using single-stroke vertical gothic style capital letters and numbers.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Demonstrate the use of each drafting tool.
2. Draw and label the alphabet of lines.
3. Use the Computer Aided Drafting (CAD) system to generate drafting symbols on the Cathode Ray Tube (CRT).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE/ADVANCED:

1. Set of drafting tools
2. Computer Aided Drafting (CAD) system or handout on symbols and lettering.

MATERIALS/CORE/ADVANCED:

Drawing paper

APPLICATION OF TERMS:

Lead holder
Erasing shield
Scale
Compass
Divider
T-square
30°/60° Triangle
45°/45° Triangle
Leader pointer
Irregular curve
Eraser

REFERENCES:

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

Spencer, Henry, and Dygdon, John, Basic Technical Drawing, Chicago, Ill.: Macmillan Publishing Co., Inc., 1980.

REFERENCE: 2.2

MAJOR TITLE: Communication Technology

UNIT TITLE: Scales Used to Communicate Size

MAJOR CONCEPT: Different scales are used to measure and graphically communicate the size of things such as: manufactured goods, buildings, pipe lines, and land.

TOPICS:

1. U.S. Customary Scale (Inch scale)
   - 1.1 Fractions
   - 1.2 Decimal
2. Metric Scale
3. Architect's Scale
4. Civil Engineer's Scale
5. Mechanical Engineer's Scale

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify
   - a. The U.S. Customary Scale
   - b. The Architect's Scale
   - c. The Civil Engineer's Scale
   - d. The Mechanical Engineer's Scale
2. Use an inch scale to measure lines and write the answer to the nearest one eighth of an inch.
3. Be able to express 1/4", 1/2", and 3/4" to decimal form and vice-versa.
4. Measure lines with a metric scale to the nearest millimeter and express the answer in centimeters/millimeters.

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify each scale (Architectural, U.S. Customary, Civil Engineer's, and Mechanical Engineer's) by writing the correct name under an illustration of each scale on a teacher prepared hand-out.
2. Express whole numbers and fractions i.e., 1 1/2, 4 1/4, 3 3/4, in their decimal form and convert decimals to their nearest fractional equivalent.
3. Measure lines with a U.S. Customary scale to the nearest 1/16 of an inch.
4. Measure lines with a metric scale, to the nearest millimeter, and express the answer in centimeters/millimeters.
5. Determine the size of the classroom using a meter stick and express the answer to the nearest meter.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Measure objects in the classroom using both the metric and inch system.
2. Draw the floor plan of the classroom using the 1/8 or 1/4 architectural scale.
3. Use the correct scale to measure drawings (Architectural, Civil Engineer's, and Mechanical Engineer's) and write the measurement on the drawings.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

1. U.S. Customary Scale (25)
2. Metric Scale (25)
3. Chalkboard & chalk

MATERIALS/CORE:

1. Prepared Hand-out Scales (25)
2. Prepared Hand-out Lines (25)

TOOLS AND EQUIPMENT/ADVANCED:

1. Meter Stick
2. Architectural Scale
3. Civil Engineers Scale
4. Mechanical Engineers Scale

MATERIALS/ADVANCED:

1. Paper
2. Prepared problems

APPLICATION OF TERMS:

Inch
Fraction
Decimal
U.S. Customary
Meter
Metric
Millimeter
Centimeter
Architectural Scale
Engineering Scale

REFERENCES:

Brown, Walter C., Drafting for Industry, South Holland, Ill: The Goodhart-Willcox Company, Inc., 1984.

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

REFERENCE: 2.3

MAJOR TITLE: Communication Technology

UNIT TITLE: Freehand Sketching

MAJOR CONCEPT: Ideas can be recorded and conveyed quickly by freehand sketches using only a pencil and paper.

TOPICS:

1. Importance of freehand sketching
2. Basic steps for making a sketch (thumbnail, rough and finished)
3. Sketching techniques
4. Proportion

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Demonstrate the proper techniques for sketching:
   - 1.1 Vertical lines
   - 1.2 Horizontal lines
   - 1.3 Inclined lines
   - 1.4 Circles
2. Explain the importance and application of sketching in communication.
3. Freehand sketch a product.

CORE INSTRUCTIONAL ACTIVITIES:

1. Verbally explain the importance of freehand sketching.
2. Freehand sketch a 1/2 inch border on a sheet of unlined paper and divide the area inside the border into four equal spaces. Sketch vertical lines about 1/2 inch apart in one space; in another space, sketch horizontal lines about 1/4 inch apart. In the third space sketch inclined lines about 3/4 inch apart and in the remaining space draw a circle with a 1 1/2 inch radius.
3. Freehand sketch an automobile approximately 8 inches long.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Freehand sketch a classroom desk about 15 cm. high illustrating correct proportion. Measure the height of the sketch and record it in centimeters.
2. Freehand sketch a floor plan for a communication lab allowing 1 in. to equal about 1 ft.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Pencil

MATERIALS/CORE:

Paper

TOOLS AND EQUIPMENT/ADVANCED:
Pencil

MATERIALS/ADVANCED:
Paper

APPLICATION OF TERMS:

Vertical	Inclined	Radius
Horizontal	Proportion	Freehand Sketch

REFERENCES:

Brown, Walter C., Drafting for Industry, South Holland, Ill.: Goodhart-Willcox Company Inc., 1984.

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

REFERENCE: 2.4

MAJOR TITLE: Communication Technology

UNIT TITLE: The Geometry of Technical Drawing

MAJOR CONCEPT: Technical drawings are a combination of geometric shapes used to form detailed objects that communicate ideas.

TOPICS:
1. Common two and three dimensional geometric shapes
2. Geometric terms

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Identify various two and three dimensional geometric shapes.
2. Demonstrate an application of geometric terms. (refer to: APPLICATION OF TERMS)

CORE INSTRUCTIONAL ACTIVITIES:
1. Match the geometric term with the drawing of two and three dimensional geometric shapes on a teacher prepared hand-out.
2. Make a freehand sketch that illustrates each of the following geometric terms: intersecting, perpendicular, tangent, parallel, diameter, radius, and bisect.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Use drafting tools to draw geometric shapes.
2. Locate different geometric shapes on a teacher provided drawing and identify them.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Pencil

MATERIALS/CORE:
1. Hand-out illustrating geometric forms and shapes
2. Hand-out of geometric terms

TOOLS AND EQUIPMENT/ADVANCED:
1. Drawing Board
2. T-square
3. 45° x 45° Triangle
4. 30° x 60° Triangle
5. Compass

MATERIALS/ADVANCED:
1. Drawing paper
2. Hand-out completed drawing

APPLICATION OF TERMS:

- Geometric Construction
- Intersecting Lines
- Diameter
- Tangent
- Isosceles Triangle
- Square
- Angle
- Circumference
- Hexagon
- Ellipse
- Perpendicular Lines
- Acute Angle
- Obtuse Angle
- Equilateral Triangle
- Arc
- Parallel
- Scalene Triangle
- Pentagon
- Vertex
- Right Angle
- Octagon
- Bisect

REFERENCES:

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

Spencer, Henry, and Dygdon, John, Basic Technical Drawing, Riverside, N.J.: Macmillan Publishing Co., Inc., 1980.

REFERENCE: 2.5

MAJOR TITLE: Communication Technology

UNIT TITLE: Multiview Drawings

MAJOR CONCEPT: Multiview drawing shows an object from two or more directions and is the most common type of technical drawing used by industry.

TOPICS:

1. Orthographic projection
2. Selecting views
3. Placement of views
4. Precedence of lines
5. Auxiliary views
6. Sectional views

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Name and locate the views of an object shown in a multiview drawing.
2. Identify objects from multiview drawings.
3. Explain the need for auxiliary views and sectional views.
4. Recognize the details illustrated by a sectional drawing.

CORE INSTRUCTIONAL ACTIVITIES:

1. Name each view of a multiview drawing depicted on a teacher provided hand-out.
2. Select the object represented by a multiview drawing from a group of teacher provided objects.
3. Select objects that would best be described by using a sectional drawing and those requiring an auxiliary view from a group of teacher provided objects.
4. Select from a group of objects the object illustrated by a teacher provided sectional drawing.
5. Prepare a freehand sketch of the third view when given a two view drawing of an object.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Draw a freehand multiview sketch of an object provided by the teacher.
2. Make a freehand sketch showing an auxiliary view of an inclined surface represented on a multiview drawing.
3. Make the required changes to illustrate a sectional drawing, as determined by a cutting plane line, when given a two view drawing with internal details shown by hidden lines.
4. Use a Computer Aided Drafting (CAD) System to generate a multiview representation of an object.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Several different shaped objects

MATERIALS/CORE:

Prepared multiview and sectional drawings

TOOLS AND EQUIPMENT/ADVANCED:

1. Several different shaped objects
2. Computer Aided Drafting (CAD) System

MATERIALS/ADVANCED:

1. Multiview drawing with one view missing.
2. Multiview drawing with an inclined surface.
3. A two view drawing suitable for sectioning.

APPLICATION OF TERMS:

Multiview Drawing
Orthographic Projection
Cutting Plane Line
Principal Views
Working Drawing
Section Lines
Projection Lines
Auxiliary View
Sectional View

REFERENCES:

Brown, Walter C., Drafting for Industry, South Holland, Ill.: Goodhart-Willcox Co., Inc., 1984.

Spencer, Henry, and Dygdon, John, Basic Technical Drawing, Riverside, N.J.: Macmillan Publishing Co., Inc., 1980.

REFERENCE: 2.6

MAJOR TITLE: Communication Technology

UNIT TITLE: Dimensioning Size & Location

MAJOR CONCEPT: Dimensions are added to a drawing to explain size and location of features.

TOPICS:

1. Determining size & location
2. Elements of dimensioning
3. Practices & rules of dimensioning

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify size dimensions and location dimensions.
2. Measure an object and place the dimensions in their proper location on a multiview drawing.
3. Read dimensions on a multiview drawing then use a scale to select from a group of objects the one depicted in the drawing.

CORE INSTRUCTIONAL ACTIVITIES:

1. Circle the size dimensions and place an asterisk beside the location dimensions on a teacher supplied fully dimensioned multiview drawing.
2. Measure the object depicted on a multiview drawing with no dimensions and write the dimensions on the drawing.
3. Use a scale to measure objects and locate the object depicted in a fully dimensioned multiview drawing.
4. Cut a styrofoam or wood model of the object shown in a fully dimensioned multiview drawing.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Make a fully dimensioned multiview drawing from a dimensioned pictorial drawing.
2. Measure a given object; draw and dimension a multiview drawing of the object.
3. Produce a fully dimensioned multiview drawing using the Computer Aided Drafting (CAD) System.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

1. Scales
2. Objects
3. Saw
4. Undimensioned multiview drawing
5. Completed multiview drawing

MATERIALS/CORE:

Styrofoam or wood

TOOLS AND EQUIPMENT/ADVANCED:

1. Drawing board
2. Computer Aided Drafting (CAD) System
3. Drawing instruments
4. Dimensioned pictorial drawing
5. Dimensioned multiview drawing

MATERIALS/ADVANCED:

Drawing paper
Masking tape

APPLICATION OF TERMS:

Dimension
Dimensioned
Arrowheads
Dimension Lines
Extension Lines
Unidirectional
Leaders
Aligned
Location

REFERENCES:

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

Spencer, Henry, and Dygdon, John, Basic Technical Drawing, Albany, N.Y.: Macmillan Publishing Co., Inc., 1980.

REFERENCE: 2.7

MAJOR TITLE: Communication Technology

UNIT TITLE: Pictorial Drawings

MAJOR CONCEPT: Pictorial drawings give a three-dimensional representation of objects.

TOPICS:

1. Isometric
2. Oblique, Cabinet and Cavalier
3. Perspective
4. Exploded or Assembly

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Draw an isometric from a multiview drawing.
2. Draw two oblique drawings illustrating both the cabinet and cavalier methods.
3. Prepare a perspective drawing from an isometric drawing.
4. Sketch an exploded view of an object shown in isometric.
5. Sketch an object from its exploded view.

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify each of the following drawings; isometric, oblique, perspective, and exploded, on a teacher prepared worksheet.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Prepare a pictorial using each of the methods discussed in class.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Drawing board
T-square
30°/60° triangle
45°/90° triangle

MATERIALS/CORE:

Teacher Worksheet
Pencil
Paper
Masking tape

TOOLS AND EQUIPMENT/ADVANCED:

Same as core

MATERIALS/ADVANCED:

Same as core

APPLICATION OF TERMS:

Pictorial
Oblique
Development
Isometric
Perspective
Horizon line (HL)
Isometric lines
Non-isometric lines
Vanishing point (VP)

REFERENCES:

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

Spencer, Henry, and Dygdon, John, Basic Technical Drawing, Albany, N.Y.: Macmillan Publishing Co., Inc., 1980.

REFERENCE: 2.8

MAJOR TITLE: Communication Technology

UNIT TITLE: Computer Aided Drafting (CAD)

MAJOR CONCEPT: Computer Aided Drafting (CAD) is one of the most modern tools of technical design communication.

TOPICS:

1. Terminology of computers/Computer Aided Drafting (CAD)
2. Components of Computer Aided Drafting (CAD)
3. Applications of Computer Aided Drafting (CAD)
4. Using a Computer Aided Drafting (CAD) system

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define the terms used in processing information with a Computer Aided Drafting (CAD) system, from a teacher given list.
2. Describe how to use the computer keyboard, digitizer, and plotter to process given information on the Computer Aided Drafting (CAD) system.
3. Use the Computer Aided Drafting (CAD) system to produce a multiview drawing.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss teacher prepared handouts on Computer Aided Drafting (CAD) components.
2. Discuss the use of the computer keyboard, digitizer, and plotter.
3. View a Computer Aided Drafting (CAD) demonstration.
4. Using your Computer Aided Drafting (CAD) program, demonstrate geometric construction.
5. Produce a multiview drawing using the Computer Aided Drafting (CAD) system.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Participate in exercise on the Computer Aided Drafting (CAD) system by following users guide and as demonstrated by the instructor.
2. Make a three-view draft of a pictorial drawing using the Computer Aided Drafting (CAD) system.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer Aided Drafting (CAD) system

MATERIALS/CORE:

Handouts
Documentation for Computer Aided Drafting (CAD)

TOOLS AND EQUIPMENT/ADVANCED:
Same

MATERIALS/ADVANCED:
Same

APPLICATION OF TERMS:
Computer Aided Drafting (CAD)
Keyboard
Plotter
Hardware
Computer
Digitizer
Software

REFERENCE:
Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

REFERENCE: 3.0

MAJOR TITLE: Communication Technology

UNIT TITLE: Introduction to Graphic Communications

MAJOR CONCEPT: The purpose of graphic communications is to develop products that will communicate visually.

TOPICS:

1. History of Graphic Communication
2. Graphic Printing Processes (relief, gravure, screen/stencil, planographic, photographic, and electrostatic)
3. Careers in Graphic Communication
4. Contributions of Graphic Communication (visual communication, printed media, advertising, reproduction)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Name the six major categories of printing.
2. List and describe developments of printing.
3. Identify various careers in the printing industry.

CORE INSTRUCTIONAL ACTIVITIES:

1. Develop a time line of printed materials showing progression and advancements in graphic communication.
2. Discuss the printing processes: relief, gravure, screen/stencil, planographic, photographic and electrostatic.
3. Produce a list of graphic communication items found in the classroom.
4. Demonstrate use of PRINT SHOP (computer software) to create an element of graphic communications. (poster, card, banner)

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Use the computer and create a piece of graphic communication utilizing computer software. (PRINT SHOP, MULTISCRIBE, APPLEWORKS, BANKSTREET WRITER)
2. Print the graphic communication using electrostatic printing.
3. Research information in graphic communications careers.
4. Communicate a graphic idea using the communication system. (input, process, output, and feedback)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer

MATERIALS/CORE:

PRINT SHOP (software)

TOOLS AND EQUIPMENT/ADVANCED:

Electrostatic Printer
Word Processing Program (MULTISCRIBE, APPLEWORKS, BANKSTREET WRITER, ETC.)

MATERIALS/ADVANCED:

Research Format

APPLICATION OF TERMS:

Graphic Communication
Relief
Gravure
Screen/Stencil
Press Operator
Camera Operator
Bindery Workers
Planographic
Photographic
Electrostatic
Illustrator
Compositer
Platemaker
Production Workers
Designer
Photographer
Writer
Editor
Reporter
Guttenburg

REFERENCES:

Documentation for computer software - furnished with software.

Heiner, Carl, and Hendrix, Wayne, People Create Technology, 1980.

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

REFERENCE: 3.1

MAJOR TITLE: Communication Technology

UNIT TITLE: Safety

MAJOR CONCEPT: Safety is an important aspect of graphic communications.

TOPICS:

1. General Laboratory Safety
2. Safety Tour of the Laboratory
3. Proper Usage and Storage of Chemicals and Solvents

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Pass a laboratory safety test with a minimum score of 85%.
2. Locate and describe potential hazards associated with equipment and storage areas.
3. Distinguish between safe and unsafe actions in the lab.

CORE INSTRUCTIONAL ACTIVITIES:

1. After a safety discussion the students will assist the instructor in developing class safety rules and procedures for documentation.
2. Design a safety bulletin board for the graphic communications lab.
3. Take a safety test.
4. Use or observe the use of a CO_2 or dry chemical fire extinguisher to put out a fire.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Develop safety posters for the graphic communications area to be displayed around the lab.
2. Analyze the potential hazards using a "Safety Procedures Analysis Technique."
3. Develop an accident prevention program for the graphic communications lab.
4. Design a safety form to use for reporting safety violations.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Overhead Projector
Transparencies
Fire Extinguisher
Metal Tray
Safety Glasses

MATERIALS/CORE:

Solvent
Matches

TOOLS AND EQUIPMENT/ADVANCED:

None

MATERIALS/ADVANCED:

Poster Board
Markers
Stencils
Meter stick

APPLICATION OF TERMS:

Safety Guards
Personal Safety
Fire Extinguisher
Safety Glasses
General Safety
Classes of Fire
Solvents
Machine & Toll Safety

REFERENCES:

Hammer, Willie, Occupational Safety and Health Engineering, Prentice-Hall, 1986.

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

State Department of Education Safety Guide (Transparencies)

REFERENCE: 3.2

MAJOR TITLE: Communication Technology

UNIT TITLE: Types of Graphic Communications

MAJOR CONCEPT: There are six major types of multiple-copy graphic communications.

TOPICS:

1. Relief
2. Gravure
3. Photographic
4. Screen/Stencil
5. Planographic
6. Electrostatic

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List six major types of graphic reproduction.
2. Explain the processes that are used with each method of reproduction.
3. Perform the following methods of graphic reproduction: (relief, gravure, photographic, screen/stencil, planographic, electrostatic)

CORE INSTRUCTIONAL ACTIVITIES:

1. Observe a teacher demonstration of relief printing. (rubber stamp and ink pad, to produce a copy on paper)
2. Observe a teacher demonstration of gravure printing by taking a piece of plastic and scratching it with a stylus, to produce a copy on paper.
3. Observe a teacher demonstration of making a photogram to demonstrate photographic methods.
4. Observe a teacher demonstration of screen printing using a paper stencil to produce a copy on paper.
5. Observe a teacher demonstration of planographic printing using a spirit master.
6. Observe a teacher demonstration of electrostatic printing using the school copier.
7. Rotate through each of the six areas demonstrated by the instructor, and produce a copy using each method.
8. Develop a notebook to place all graphic communication work in. The first section will be represented with the copies that they have produced.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Develop a technological assessment form to evaluate the impact of the major graphic reproduction processes. (people, information, materials, tools and machines, energy, capital, time)
2. Apply the assessment form to any of the six areas. (relief, gravure, photographic, screen/stencil, planographic, electrostatic)
3. Research an area of graphic reproduction and complete a written report or oral presentation to the class.

4. Utilize a computer and a word processing program and produce a copy that will be reproduced either on the spirit duplicator or using the electrostatic process.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Rubber Stamp
Brayer
Screen Print Framer
Copier
Ink Pad
Pin-Hole Camera
Squeegee
X-Acto Knife
Stylus
Glass Plates
Duplicator

MATERIALS/CORE:

Paper
Water Soluble Inks
Spirit Master
Developing Chemicals

TOOLS AND EQUIPMENT/ADVANCED:

None

MATERIALS/ADVANCED:

None

APPLICATION OF TERMS:

Relief
Screen/Stencil
Rubber Stamp
Brayer
Screen Print Frame
Copier
Dektol
D-76 Developer
Gravure
Planographic
Ink Pad
Pin-Hole Camera
Squeegee
Spirit Master
Fixer
Tongs
Photographic
Electrostatic
Stylus
Glass Plate
Duplicator
Water Soluble Inks
Stop Bath

REFERENCES:

Adams, J. Michael, and Faux, David, Printing Technology, 1982.

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

Walker, John R., Graphic Arts Fundamentals, 1986.

Word Processing Program, (BANKSTREET WRITER, APPLEWORKS, MULTISCRIBE) Any computer store will have this software.

REFERENCE: 3.3

MAJOR TITLE: Communication Technology

UNIT TITLE: Layout & Design

MAJOR CONCEPT: Layout and design help create well designed images for graphic reproduction.

TOPICS:

1. Definition of Layout (formal, informal, symmetrical, asymmetrical)
2. Elements of Design (balance, contrast, rhythm, unity, proportion)
3. Cropping
4. Printers Layout
5. Paste-up

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define layout and printers layout. (formal, informal, symmetrical, and asymmetrical)
2. Define the five elements of design. (balance, contrast, rhythm, unity, proportion)
3. Create thumbnail sketches implementing the elements of design and layout. (i.e. an assigned offset job)
4. Create rough sketches implementing the elements of design and layout. (i.e. an assigned offset job)
5. Properly crop a photograph.
6. Layout a single page using straight type.
7. Layout a page that includes both straight type and a photograph.
8. Create a paste-up using the elements of design and printers layout.

CORE INSTRUCTIONAL ACTIVITIES:

1. Collect examples of the five elements of design and paste them into the graphics notebook.
2. Discuss layout and printers layout. (formal, informal, symmetrical, and asymmetrical)
3. Discuss the five elements of design. (balance, contrast, rhythm, unity, proportion)
4. Develop five thumbnail sketches of a graphic communications job utilizing the five elements of design to plan a layout.
5. Develop two rough sketches of a graphic communications job utilizing the five elements of design to plan a full-size layout.
6. Copy fit a comprehensive layout from the rough sketches.
7. Crop a photograph using a proportional scale.
8. Design a single page layout using straight type.
9. Design a single page layout using straight type and a photograph.
10. Design a paste-up of a graphic communications job on a piece of illustration board. (Adhere the typeset copy using wax.)

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design a two-page comprehensive layout using straight type and photographs.

2. Use a phototypesetter to design a comprehensive layout.
3. Develop a set of thumbnail sketches for a new product, then refine them to get a printers layout.
4. Develop a comprehensive layout using a computer and PRINT SHOP or NEWSROOM (computer software) to get a copy camera ready.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Line Gauge
X-Acto Knife
Scale
Hot Wax Machine
Hot Type
T-square
White-Out
Paper Cutter
Transfer Letters
45 Degree Angle
Inking Pen

MATERIALS/CORE:

Paper
Poster Board
Illustration Board
India Ink
Wax
Art Gum
Rubber Cement

TOOLS AND EQUIPMENT/ADVANCED:

Computer
PRINT SHOP
Phototypesetter
NEWSROOM

MATERIALS/ADVANCED:

Same as Core

APPLICATION OF TERMS:

Formal Balance
Informal Balance
Contrast
Rhythm
Unity
Cropping
Pasteup
Pica
Phototypesetter
Paper Cutter
Display Type
Text Type
Foundry Type
Rough Sketch
Transfer Letters
Proofreading
Typeface
Point
Typesetting
Compositor
Hot Type
Thumbnail Sketch
Cold Type
Comprehensive Layout
Line Gauge
Camera Ready
Proportional Scale
Hot Wax Machine

REFERENCES:

Adams, J. Michael, and Faux, David D., Printing Technology, Delmar Publishers, Inc., 1982.

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

PRINT SHOP & NEWSROOM, Computer Software available from Silicon Express, Columbus, Ohio 43213.

Walker, John R., Graphics Arts Fundamentals, South Holland, Ill.: Goodhart-Willcox Co., 1986.

REFERENCE: 3.4

MAJOR TITLE: Communication Technology

UNIT TITLE: Relief Printing

MAJOR CONCEPT: Relief printing is a process of transferring ink from a raised surface to another surface.

TOPICS:

1. Definition of Relief
2. Letterpress
3. Linoleum Block Printing
4. Flexography

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Set and print with foundry type.
2. Create samples of different relief printing processes.
3. Cut and print with a linoleum block.
4. Make a rubber stamp.
5. List and define relief printing processes.
6. Calculate the most efficient method to cut standard paper to a given size and cut the number of pieces required for a job.

CORE INSTRUCTIONAL ACTIVITIES:

1. Carve initials in a potato using a paring knife, then use an ink pad and produce basic relief printing.
2. Cut paper stock for making business cards.
3. Using foundry type and a platen press print a business card.
4. Develop a linoleum block print by carving out linoleum with linoleum gouges. Print the carving using a proof press, brayer, and water soluble inks.
5. Experiment with different colors of ink and different colored paper using the linoleum block.
6. Develop a rubber stamp using cold type and a heating unit to heat the rubber and form a rubber stamp. (Mount rubber stamp on a block of wood, then use a stamp pad to produce copies.)
7. Mount examples of four types of relief printing in a notebook.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Incorporate relief printing with another printing process and make copies.
2. Develop a relief process using more than one color having acceptable registry.
3. Print on other media besides paper using a relief process.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Proof Press
- Brayer
- Cold Type
- Line Gauge
- Platen Press
- X-Acto Knife
- Job Case
- Paper Cutter
- Heat Transfer Machine
- Foundry Type
- Paring Knife

MATERIALS/CORE:

- Water Soluble Inks
- Linoleum
- Stamp Pads
- Wood
- Paper
- Glue

TOOLS AND EQUIPMENT/ADVANCED:

Same as Core

MATERIALS/ADVANCED:

Same as Core

APPLICATION OF TERMS:

- Linoleum
- Proof Press
- Line Gauge
- Rubber
- Block Printing
- Brayer
- Registry
- Flexography
- Platen Press
- Foundry Type
- Heat Transfer Machine
- Letterpress

REFERENCES:

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

REFERENCE: 3.5

MAJOR TITLE: Communication Technology

UNIT TITLE: Gravure Printing

MAJOR CONCEPT: Gravure printing is the process that involves printing from a depressed surface.

TOPICS:

1. Gravure Printing Process
2. Drypoint Etching

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain the gravure printing process.
2. Demonstrate the gravure printing process through drypoint etching.
3. Print using a drypoint etching.
4. Identify the application of gravure printing in today's printed material.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the gravure printing process.
2. Create a drypoint etching using a stylus to scratch a piece of plastic to create a gravure plate.
3. Use an oil base ink and a brayer ink to ink the gravure plate and use a cloth to remove the excess ink.
4. Print with a proof press and the gravure plate and create a print.
5. Demonstrate engraving a piece of plastic with a Computer Numeric Control (CNC) milling machine to create a gravure plate.
6. Mask off an aluminum plate and acid etch a design for gravure printing.
7. Print using the plate created on the Computer Numeric Control (CNC) milling machine or by acid etching, using the proof press.
8. Prepare the examples of gravure printing for display in the student notebook.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Create a gravure plate using the Computer Numeric Control (CNC) milling machine or by acid etching.
2. Print examples of the gravure process using the prepared plate.
3. Print on plastic and different types of paper, using different colored inks, to illustrate various applications of the gravure process.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Stylus
Proof Press
Brayer
Computer Numeric Control (CNC) Milling Machine

MATERIALS/CORE:

Plexiglass 1/8"
Paper
1/8" Piece of Aluminum 4" x 4"
Oil-based Ink
Plastic Sheeting
Muriatic Acid

TOOLS AND EQUIPMENT/ADVANCED:

Same as Core

MATERIALS/ADVANCED:

Same as Core

APPLICATION OF TERMS:

Gravure
Rotogravure
Solvent
Brayer
Drypoint Etch
Package Printing
Proof Press
Diffusion Etch
Oil-based Ink
Computer Numeric Control (CNC) Milling Machine

REFERENCES:

Adams, J. Michael, and Faux, David D., Printing Technology, Albany, N.Y.: Delmar Publishers, 1982.

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

REFERENCE: 3.6

MAJOR TITLE: Communication Technology

UNIT TITLE: Screen Printing

MAJOR CONCEPT: Screen printing is a process whereby ink is transferred through a screen onto the object being printed.

TOPICS:

1. Stencils
2. Screens
3. Screen Printing Process
4. Inks
5. Applications of the Screen Process

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain the process of screen printing.
2. Design a stencil for screen printing.
3. Cut a stencil and apply it to the screen.
4. Demonstrate competencies by completing steps in making three individual screen prints.
5. Print on three different types of surfaces. (cloth, paper, glass, plastic, metal, etc.)
6. Participate in mass production project to produce T-shirts.
7. Mount a screen to a frame.

CORE INSTRUCTIONAL ACTIVITIES:

1. Cut a paper stencil out of wax paper using a x-acto knife.
2. Mount the paper stencil to a frame and block out the screen.
3. Mount a screen to the frame.
4. Print using water soluble ink with the paper stencil.
5. Cut a lacquer stencil using an x-acto knife and adhere it to a screen.
6. Print using the lacquer stencil and two different types of ink on a minimum of two different media.
7. Clean screens and prepare them for storage.
8. Using a thermal stencil, design a T-shirt that will be mass produced in the lab.
9. Save a sample of each type of screen printing and label it to be included in the notebook.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Screen print using two different colors and get acceptable registry on two different media.
2. Develop a photo stencil using an ortho negative of the original design.
3. Print using a screen and the photo stencil after it has been blocked out.
4. Design a heat transfer image.
5. Screen a design onto transfer paper using plastisol ink.
6. Heat set the ink.
7. Adhere the design to a T-shirt.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Screen Frame
- Brush
- Squeegee
- Thermal Fax Copier
- X-Acto Knife

MATERIALS/CORE:

- Water-base Ink
- Wax Paper
- Block out
- Paper
- Oil-base Ink
- Lacquer Stencil
- Masking Tape
- Cloth
- Textile Ink
- Thermal Stencil
- Stapler/Staples
- T-Shirt

TOOLS AND EQUIPMENT/ADVANCED:

- Iron
- Thermal Lamp
- Light

MATERIALS/ADVANCED:

- Pre-sensitized Film
- Transfer Paper
- Cloth
- Developer
- Mineral Spirits
- Plastisol Ink
- Lacquer Thinner

APPLICATION OF TERMS:

- Screen Fabric
- Screen Frame
- Kerf
- Squeegee
- X-Acto Knife
- Paper Stencil
- Sizing
- Lacquer Thinner
- Fabric Cord
- Blockout
- Mass Production
- Transfer Paper
- Lacquer Film
- Substrate
- Liquid Tusche
- Ortho Positive
- Water-based Ink
- Oil-based Ink
- Plastisol Ink
- Thermal Stencil
- Pre-sensitized Film
- Masking Tape
- Mineral Spirits

REFERENCES:

Farrar, Patti, *Cite*, "Thermal Silkscreen Printing", Munice, Ind.: Baltimore State University, CM-R-009, 1987.

Goetsch, David L., and Nelson, John A., *Technology and You*, Albany, N.Y.: Delmar Publishers, 1987.

Jones, Ronald E., and Robb, Janet L., *Discovering Technology Communication*, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

REFERENCE: 3.7

MAJOR TITLE: Communication Technology

UNIT TITLE: Planographic Printing

MAJOR CONCEPT: Planographic printing is a reproduction process using a flat surface plate.

TOPICS:

1. Planographic Printing Process
2. Direct Image Transfer
3. Indirect Image Transfer

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define direct image transfer.
2. Identify three types of direct image transfer. (Electrostatic, Photographic Copy, Line Copy)
3. Define indirect image transfer.
4. Develop an offset print using planography.
5. Use a computer for layout.
6. Identify and explain the five major components of an offset press unit. (Feeding System, Delivery System, Inking System, Dampening System, Printing System)

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss reproduction process.
2. Use a computer to layout a spirit master that will be duplicated using a spirit duplicator to carry out offset printing.
3. Identify the inking, main printing, feeding, delivery, and transfer process using a spirit duplicator.
4. Using a publishing program and a computer, develop a newsletter to be taken home to the parents describing the communications unit.
5. Use the thermofax machine and burn a stencil for the spirit duplicator.
6. Print an industrial technology newsletter using the spirit duplicator.
7. Develop a direct image transfer using a piece of glass and a crayon.
8. Ink a direct image transfer with oil-based ink and print on paper using the planographic process.
9. Mount an example of each type of planographic system to be displayed in the student notebook.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Layout an offset job using the principles of design.
2. Use the process camera and shoot and develop a negative.
3. Take goldenrod and mask out the negatives.
4. Opaque the negative using an opaque solution.
5. Make an offset plate using a platemaker.
6. Process the plate with desensitizer.
7. Print on paper the product using an offset press with an ink fountain.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer
Brayer
Spirit Duplicator
Thermofax Machine

MATERIALS/CORE:

Crayon
Duplicating Master
Glass
Duplicating Fluid
Ink
Thermofax Master

TOOLS AND EQUIPMENT/ADVANCED:

Offset Press
Process Camera
Light Table
T-Square
Platemaker
X-Acto Knife

MATERIALS/ADVANCED:

Offset Plate
Developer
Goldenrod
Ink
Film
Stop Bath
Desensitizer
Blanket Wash
Ortho Film
Fixer
Paper
Solvents

APPLICATION OF TERMS:

Photoconversion
Stripping
Spirit Duplicator
Brayer
Thermofax
Direct Image Transfer
Process Camera
Developer
Fixer
Opaque
Desensitizer
Solvents
Inking System
Printing System
Stock
Ground Glass
Spirit Master
Computer
Crayon
Offset Plate
Indirect Image Transfer
Safelights
Stop Bath
Emulsion
Process Gum
Negative
Delivery System
Dampening System
Feeding System
Registry

REFERENCES:

Goetsch, David L., and Nelson, John A., Technology and You, Albany, N.Y.: Delmar Publishers, 1987.

Hacker, Michael, and Barden, Robert, Technology in Your World, Albany, N.Y.: Delmar Publishers, 1987.

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

REFERENCE: 3.8

MAJOR TITLE: Communication Technology

UNIT TITLE: Bindery and Finishing

MAJOR CONCEPT: The final process of graphic communication involves binding and finishing the product.

TOPICS:

1. Binding Processes
2. Finishing Processes

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify seven binding methods. (mechanical, loose-leaf, wire stitch, sewn soft cover, perfect, padding)
2. Identify nine methods of finishing a graphic product. (cutting, folding, scoring, perforating, gathering, punching/drilling, die cutting, hot stamping, laminating)
3. Incorporate one of the printing processes to product a note pad that will be finished and bound.
4. Bind a notebook.
5. Finish a notebook utilizing one of the finishing processes.

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify teacher provided examples of seven binding processes.
2. Identify teacher provided examples of nine finishing processes.
3. Define the binding and finishing processes.
4. Utilize the computer to design a cover for the graphic communication notebook.
5. Laminate the cover using a laminating machine to carry out a finishing process.
6. Bind the notebook together using a three hole punch and put it in a ring binder.
7. Using a printing process print thirty sheets for a note pad.
8. Cut a piece of cardboard and the thirty sheets to a standard size using a paper cutter.
9. Using an adhesive bind the note pad together.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Using a gold press on letter prepare a cover for magazines to be bound.
2. Utilize the computer to design the cover for magazines that are going to be bound.
3. Drill the collection of magazines that are going to be bound.
4. Laminate the cover for the magazine collection.
5. Using the side sewing method join the magazines and the cover together.
6. Apply an adhesive type binding to the outer edge of the magazine collection.
7. Use a plastic binder to bind instructional sheets together for the instructor.

8. Using the computer and a publishing program generate a card that has to be folded.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer
Laminating Machine
Clamp for Note Pads
Paper Cutter
Three Ring Hole Punch

MATERIALS/CORE:

Printed Sheets
Adhesive
Publishing Program
Three Ringer Binder
Padding
Brush
Laminating Film
Cardboard

TOOLS AND EQUIPMENT/ADVANCED:

Plastic Binding Machine
Drill Press

MATERIALS/ADVANCED:

Plastic Binder
Gold Press on Letters
Adhesive Binding
Needle
Nylon Thread

APPLICATION OF TERMS:

Binding
Mechanical
Wire Stitch
Sew Case Bond
Padding
Folding
Perforating
Punching/Drilling
Hot Stamping
Backbone
Brush
Needle
Plastic Binder
Side Sewing
Side Stitching
Finishing
Loose-Leaf
Sewn Soft Cover
Perfect
Cutting
Scoring
Gathering
Die Cutting
Laminating
Adhesive
Hole Puncher
Nylon Thread
Binding Machine
Saddle Sewing
Saddle Stitching

REFERENCES:

Goetsch, David L., and Nelson, John A., Technology and You, Albany, N.Y.: Delmar Publishers, 1987.

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

REFERENCE: 4.0

MAJOR TITLE: Communication Technology

UNIT TITLE: Introduction to Photographic Technology

MAJOR CONCEPT: Photography uses light to convey an image to a photo-sensitive material.

TOPICS:

1. Light
2. Photo-Sensitive Materials
3. Cameras
4. The Darkroom
5. Basic Chemical Processes (Black and White)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify five basic elements of photography (light, photo-sensitive material, camera, darkroom, and chemical processes) and briefly describe how they interact.
2. Identify the primary function of a camera.
3. Identify two categories of photo-sensitive materials (photographic film and photographic paper).
4. Identify two common uses for a photographic darkroom.
5. Identify the three major chemical processes involved in developing black and white photographic films and papers (development, stop bath, and fix).

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the procedures used to create photograms. Create a minimum of two photograms using found objects.
2. Develop a minimum of two photograms using standard print development techniques. Evaluate the finished products and discuss the results.
3. Discuss the processes involved in loading film canisters using a bulk loader. Load at least one roll of photographic film from a bulk loader.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Experiment with making photograms using photographic papers of various grades, weights, surface textures, and tonal qualities. Evaluate and discuss the results.
2. Load a roll of bulk film (50 ft. or 100 ft.) into a bulk film loader. (CAUTION: This must be done in absolute darkness. The student should be accompanied by the teacher.)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Enlarger
- Bulk Film Loader
- Print Washer
- Print Tongs
- Safe Light
- Processing Trays (4)
- Scissors
- Drying Rack
- Thermometer

MATERIALS/CORE:

- Photographic Paper
- Bulk Film
- Selection of Objects (found at home or school)
- Film Canisters
- Processing Chemicals
- Masking Tape

TOOLS AND EQUIPMENT/ADVANCED:

Same as Core Activities

MATERIALS/ADVANCED:

Same as Core Activities

APPLICATION OF TERMS:

- Photo-sensitive Material
- Photographic Paper
- Photographic Film
- Light Tight
- Darkroom
- Changing Bag
- Resin Coated Paper
- Fiber Based Paper
- Develop
- Developer
- Stop Bath
- Indicator Stop Bath
- Fixer
- Photogram
- Canister
- Bulk Film

REFERENCES:

Seymour, Richard D., Exploring Communications, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1987.

Walker, John R., Graphic Arts Fundamentals, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1986.

REFERENCE: 4.1

MAJOR TITLE: Communication Technology

UNIT TITLE: The Camera: Application of Basic Photographic Principles

MAJOR CONCEPT: Quality photography requires application of basic photographic principles and camera operations.

TOPICS:

1. Principles of Camera Operations
2. Basic Parts of the Camera
3. Types of Cameras

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain the operation of a basic camera.
2. Name the essential parts of a basic camera (lens, camera body, film holder, and shutter).
3. Identify five simple types of cameras (view, range finder, single lens reflex, twin lens reflex).
4. Construct and demonstrate proper techniques in using a pinhole camera (simple).
5. Develop black and white photographs using standard development procedures.

CORE INSTRUCTIONAL ACTIVITIES:

1. Using a teacher prepared handout, have students identify photographs or drawings of different types of cameras, label the parts of a basic camera, and explain how these parts interact to produce a photographic image.
2. Identify the major parts of a basic camera using a pinhole camera. Describe how the pinhole acts as a lens and how the photographic image is projected onto the light-sensitive material.
3. Construct a pinhole camera.
4. Load the pinhole camera with single or medium weigh photographic paper. Make a minimum of two exposures (continue until proper exposure is achieved). Develop the exposures using standard print development techniques.
5. Print positive images from the negatives developed in activity number four.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Describe the techniques used to produce a timed exposure. Produce a timed exposure using a pinhole camera; develop the negative; and make a positive from the negative. Discuss the outcome.
2. Describe the procedures used to produce a multiple exposure using a pinhole camera. Use a pinhole camera to produce the multiple exposure; develop the negative; and make a positive from the negative. Discuss the outcome.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- X-Acto Knife
- Enlarger
- Safelight
- Processing Trays (4)
- Timer
- Print Tongs
- Scissors
- Tin Snips
- Print Washer
- Drying Rack
- Darkroom Sink

MATERIALS/CORE:

- Teacher Prepared Handouts
- Photographic Paper
- Processing Chemicals
- Oatmeal Box
- Electrician's Tape
- Aluminum Can
- Fine Sandpaper
- Small Piece of Posterboard
- Sharp Needle
- Black Spray Paint

TOOLS AND EQUIPMENT/ADVANCED:

Same as Core Activities

MATERIALS/ADVANCED:

- Photographic Paper
- Processing Chemicals

APPLICATION OF TERMS:

- Camera Body
- Lens
- Film Holder
- Shutter
- View
- Single Lens Reflex (SLR)
- Photo-sensitive Material
- Timed Exposure
- Multiple Exposure
- Negative Image
- Positive Image
- View Finder
- Twin Lens Reflex (TLR)

REFERENCES:

Seymour, Richard D., Exploring Communications, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1987.

Walker, John R., Graphic Arts Fundamentals, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1986.

REFERENCE: 4.2

MAJOR TITLE: Communication Technology

UNIT TITLE: The 35mm Single Lens Reflex (SLR) Camera

MAJOR CONCEPT: The 35mm SLR is a commonly used camera, combining versatility with maximum control of the photographic medium.

TOPICS:

1. Parts of the 35mm camera
2. Loading, advancing, and unloading film
3. Holding and carrying a camera
4. Lens changing, care, and accessories
5. Preventive maintenance and storage

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify the parts of a basic 35mm single lens reflex (SLR) camera.
2. Demonstrate proper procedures of loading, advancing, and unloading film.
3. Demonstrate proper methods of holding and carrying a 35mm camera.
4. Demonstrate proper techniques for changing camera lens.
5. Discuss proper care, maintenance, and storage of cameras and lenses.

CORE INSTRUCTIONAL ACTIVITIES:

1. Label the parts of a 35mm single lens reflex (SLR) camera using a teacher prepared handout.
2. Identify the major parts and describe the functions of a 35mm single lens reflex (SLR) camera. Demonstrate proper methods of holding the camera (vertical and horizontal), and proper methods of carrying the camera (small groups provided with a 35mm camera).
3. Following a teacher demonstration, practice changing lenses, loading, advancing, and unloading film (small groups provided with a 35mm camera).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Examine other types of cameras (medium format single lens reflex (SLR), twin lens reflex, view, etc.).
2. Compare advantages and disadvantages of the different systems (SLR versus TLR, etc.).
3. Develop a consumer guide (class use) for 35mm single lens reflex (SLR) camera. Research periodicals (Modern Photography, Popular Photography, etc.) and develop a chart comparing costs and specific features of various models.
4. Write a user guide explaining the proper care, preventive maintenance, and storage requirements for a 35mm single lens reflex (SLR) camera.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
35 mm Camera(s) with Lens

MATERIALS/CORE:
Teacher Prepared Handout: Parts of a 35mm single lens reflex (SLR) Camera

TOOLS AND EQUIPMENT/ADVANCED:
Variety of Cameras

MATERIALS/ADVANCED:
Periodicals

APPLICATION OF TERMS:

Vertical Format
Horizontal Format
Camera Body
Lens
Lens Mount
Index Point
Camera Back
Viewfinder
Take Up Sprockets
Film Release Button
Shutter Release Button
Film Path
Film Plane
Pressure Plate
Mirror
Prism
Rewind Knob (Lever)
Shutter

REFERENCES:

Seymour, Richard D., Exploring Communications, South Holland, Ill.: The GoodHeart-Willcox Company, Inc., 1987.

Walker, John R., Graphic Arts Fundamentals, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1986.

REFERENCE: 4.3

MAJOR TITLE: Communication Technology

UNIT TITLE: Composition

MAJOR CONCEPT: Composition is a process in the art of photography through which the photographer creates, develops, and communicates ideas and feelings.

TOPICS:

1. Subject Placement (rule of thirds)
2. Horizontal and Vertical Formats
3. Camera Angle
4. Additional Factors (foreground, background, depth of field, selective focus, framing, artistic license, etc.)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify any five (5) factors (format, subject position, center of interest, foreground elements, background elements, selective focus, camera angle, and depth of field) which contribute to "Good" composition.
2. Analyze and critique the composition of selected photographs according to the criteria established in class (factors listed above).
3. Compose one or more photographs which demonstrate the utilization of the basic principles of composition.
4. Compose photographs using vertical and horizontal formats.

CORE INSTRUCTIONAL ACTIVITIES:

1. Analyze and critique the composition of selected photographs (provided by the teacher). Identify and discuss the compositional factors used and omitted. Identify changes in composition which could be made to improve the photograph. If no changes appear to be needed, indicate this and defend your position.
2. From a contact sheet select properly exposed photographs which utilize the basic principles of "Good" composition. Study the frames selected and crop where necessary to improve the overall composition.
3. Utilizing the basic principles of composition, compose a series of photographs. Each photo in the series should emphasize one particular aspect of basic composition. Use both vertical and horizontal formats.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Explore how various focal length lenses (wide angle, medium tele-photo, long tele-photo, and zoom) affect composition. Report to the class your findings regarding depth of field, camera angle, foreground, background, and selective focus.
2. Use different types of cameras and lenses to explore how camera format affects composition.

EVALUATION:

Lessons will be evaluated by teacher made-tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Camera/Normal Lens

MATERIALS/CORE:

Selection of Photographs
Contact Sheets
Film

TOOLS AND EQUIPMENT/ADVANCED:

Variety of Cameras (TLR, SLR-Medium Format, Press, View, whatever is available)
Several Lenses of Varied Focal Length (35mm)

MATERIALS/ADVANCED:

Film

APPLICATION OF TERMS:

Composition
Subject
Background
Foreground
Depth of Field
Selective Focus
Focal Length
Format
Vertical Format
Horizontal Format
Tele-photo
Wide Angle

REFERENCES:

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

Seymour, Richard D., Exploring Communications, South Holland, Ill: The Goodheart-Willcox Company, Inc., 1987.

REFERENCE: 4.4

MAJOR TITLE: Communication Technology

UNIT TITLE: Exposure

MAJOR CONCEPT: Exposure is the process which controls the amount of light striking the photo-sensitive material.

TOPICS:

1. Definition of Exposure
2. Aperture
3. Shutter Speed
4. The Metering System
5. Depth of Field
6. ASA/ISO (Film Speed)
7. Determining Proper Exposure Using a Meter
8. Estimating Proper Exposure

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define: aperture, shutter, shutter speed, depth of field, f-stop, meter, bracket, and exposure.
2. Properly expose film using the internal metering system of the camera.
3. Properly expose film in an available light situation, using estimation.
4. Control for desired depth of field by adjusting aperture and shutter speed.

CORE INSTRUCTIONAL ACTIVITIES:

1. Using a computer and a crossword puzzle program, develop a computer generated crossword puzzle incorporating the following terms:

Aperture	F-Stop
Shutter	Meter
Shutter Speed	Exposure
Depth of Field	Bracket

2. Using a 35mm single lens reflex(SLR) with a built in exposure meter (LED, CDS), photograph a variety of objects under different lighting conditions. (Use a moderately high speed film such as T-MAX (400 ASA) to provide as much flexibility as possible).
3. Using the built in exposure meter, make a minimum of two correct exposures using different apertures and shutter speeds. Record exposure information for each exposure. (The same shutter speed or aperture should not be used more than once, if possible). Record the distance from the object as indicated on the depth of field scale on the lens. Also record the focal length of the lens for future reference.

4. Estimate correct exposure by setting the shutter speed of the camera to the speed closest to the speed of the film being used (400 ASA Film - Shutter Speed = 1/500). Use an atmospheric condition scale to determine the aperture:

ASA 400 FILM	
Bright Sun	f16 - f11
Bright Hazy	f11 - f8
Slightly Overcast	f8 - f5.6
Cloudy (Heavy)	f5.6 - f4
Deep Shadows	f4 - f2.8

(The same scale can be generalized to other film speeds by adjusting the shutter speeds accordingly. Be sure to bracket exposures to insure quality.)

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Using a slow speed film and a small aperture (f22-f16), experiment with timed exposures. (The camera needs to be supported by a tri-pod or other device. The shutter speed should be set on B (Bulb) so that the shutter remains open for the desired period of time. This activity can be done at night for dramatic results. Note: this is an inexact process which may require considerable experimentation.)
2. Experiment with multiple exposure. (This may easily be accomplished by either one of two methods. One method requires shooting two or more shots, under-exposing each shot so that the combined exposures equal the proper exposure of the film. The other method requires masking a portion of the lens so that only a portion of the film is exposed during any one exposure.)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer
Printer
35mm single lens reflex(SLR)

MATERIALS/CORE:

A crossword puzzle program
Film (400 ASA)

TOOLS AND EQUIPMENT/ADVANCED:

35mm single lens reflex(SLR)
Tri-pod

MATERIALS/ADVANCED:

Film (400 ASA)

APPLICATION OF TERMS:

- Aperture
- Meter
- F-Stop
- Depth of Field
- Multiple Exposure
- Shutter Speed
- Shutter
- Bracket
- Exposure

REFERENCES:

Seymour, Richard D., Exploring Communications, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1987.

Walker, John R., Graphic Arts Fundamentals, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1986.

REFERENCE: 4.5

MAJOR TITLE: Communication Technology

UNIT TITLE: Properties of Film and Film Development

MAJOR CONCEPT: An understanding of the properties of films and the film development processes is essential to the creation of quality photographic images.

TOPICS:

1. Types of Film
2. Film Speed
3. Film Developing Equipment and Materials
4. Black and White Film Processing

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify a minimum of three (3) types of photographic film
2. Identify the basic equipment used in black and white film processing.
3. Explain the significance of ASA/ISO ratings.
4. Demonstrate proper procedures for developing black and white film.

CORE INSTRUCTIONAL ACTIVITIES:

1. Using empty film canisters or film boxes, identify the types of film represented, indicate their suggested speed (ASA/ISO rating), and identify standard uses for each film.
2. Using finished photographic products, analyze the products to determine what type of film was used. These materials may be provided by the instructor.
3. Identify the necessary equipment and photographic supplies (chemicals) needed to develop black and white film. Set up the equipment in the darkroom according to standard photographic procedures. Mix and prepare all chemicals according to the directions provided with the chemicals.
4. Using black and white film previously exposed, develop the film utilizing standard development procedures. After drying, inspect the film for proper exposure and development. Using a film loop (magnifier), examine the developed film for defects due to improper or inadequate development procedures.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Develop additional rolls of exposed film (B&W) of different speeds (T-MAX 100, T-MAX 400, etc.).
2. Experiment with different developers (B&W) to determine their individual properties and characteristics. Develop a chart indicating specific characteristics of the different developers (contrast, tone graduation, grain, etc.).
3. Expose and develop a roll of Chromogenic film (XP1 or Vario-XL). Report your findings regarding the exposure capabilities and the development procedures when using these relatively new films.

4. Push a roll of T-MAX (400-ASA) one or two stops using Acufine or a similar developer.
5. Pull a roll of Tri-X (400-ASA) one stop by using Microdol or a similar developer. Experiment with time reduction using a standard developer.
6. Develop a roll of color reversal film (Ectachrome) using the E-6 process.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Developing Tank & Reels
Thermometer
Timer
Measuring Graduates
Funnel
Stirring Rod
Chemical Storage Containers
Film Loop
Film Cassette Opener (bottle opener)
Scissors
Film Clips
Hose (for rinsing)
Negative Files
Sponge (optional)
Changing Bag (optional)
Safe Light

MATERIALS/CORE:

Film Developer (D-76 or equivalent)
Exposed Film
Fixer (Kodafix or Rapid Fix)
Running Water (rinse)
Stop Bath
Wetting Agent
Empty Film Cassettes or Boxes
Finished Photographic Materials

TOOLS AND EQUIPMENT/ADVANCED:

Same as Core Activities

MATERIALS/ADVANCED:

Core Materials Plus:
Variety of Different Speed B&W Films (T-MAX 100, T-MAX 400, etc.)
Variety of Developers (HC-110, Microdol, Ilford ID-11, Edwal FG-7, Acufine, Agfa Rodinal, etc.)
Ectachrome Film
E-6 Chemistry
XP1 and Chemistry

APPLICATION OF TERMS:

Develop
Stop Bath
Fix (Hypo)
Film Speed
Reversal
Over Develop
Air Bell
Fogged
Cassette
Changing Bag
Wetting Agent
Grain
Agitation
Uneven Development
Density
Chromogenic
Highlight
Shadow Detail
Exposure Latitude
Under Develop
Contrast

REFERENCES:

Minolta Corporation, Black & White Home Developing, New York, N.Y.: Doubleday & Co., 1982.

Paterson Products Limited, The Book of the Darkroom, Sherborne, England: Sawtells of Sherborne Limited, 1979.

Seymour, Richard D., Exploring Communications, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1987.

Walker, John R., Graphic Arts Fundamentals, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1986.

REFERENCE: 4.6

MAJOR TITLE: Communication Technology

UNIT TITLE: Contact Printing and Enlarging

MAJOR CONCEPT: Print development involves the use of light and chemical processes to transfer an image onto a light sensitive material.

TOPICS:

1. Photographic Papers
2. Contact Printing
3. Making a Test Strip
4. Printing and Enlargement
5. Special Techniques

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify properties of different photographic papers (bases, surface texture, tone, contrast weight, etc.).
2. Properly expose a test strip.
3. Properly expose a contact sheet.
4. Enlarge a minimum of two (2) prints using proper procedures and techniques.

CORE INSTRUCTIONAL ACTIVITIES:

1. Inspect a selection of photographic papers (supplied by the teacher). Determine weight, texture, and base. Evaluate contrast, image tone, paper tint, etc. Discuss the different papers, their characteristics, and their uses.
2. Contact print negatives which were developed in a previous activity on an 8X10 sheet of photographic paper. Evaluate the contact sheet and reprint if necessary. Analyze and evaluate each frame on the contact sheet. Use exposure and composition as the primary criteria for evaluation. Select a minimum of two frames to be enlarged.
3. Enlarge one of the two frames selected in the previous activity to a 3 1/2 x 5 format. Crop and experiment with various compositions before actual printing. Once the composition has been finalized, print a test strip to determine proper exposure. Alternate exposures on the test strip should be in 5 second intervals. Evaluate the test strip to determine the proper exposure time and filtration requirements as needed. Repeat the above procedure for the second frame selected, but enlarge to a 5X7 print.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Research information pertaining to advanced enlarging techniques. Practice burning in and dodging techniques. Make an enlargement (8X10) using burning in and dodging techniques studied.
2. Develop texture screens for special effects. (This may be done by photographing very simple objects with strong line definition eg. screen, crushed ice, sand, etc.). Use these screens to sandwich with standard negatives for special printing effects. Print one special effect using the screen.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Enlarger/Lens
- Contact Printer
- Easel
- Contrast Filters
- Focusing Aid
- Timer
- Safelight
- Trays (4)
- Tongs
- Print Washer
- Print Dryer or Drying Rack
- Camel-hair Brush
- Canned Air
- Storage Containers for Chemicals
- Paper Cutter

MATERIALS/CORE:

- Exposed Negatives
- Developer
- Stop Bath
- Fixer
- Photographic Paper
- Selection of Sample Papers
- Running Water (Wash)
- Hypo-check

TOOLS AND EQUIPMENT/ADVANCED:

- Same as Core Activities
- Burning and Dodging Tools
- Camera

MATERIALS/ADVANCED:

- Film

APPLICATION OF TERMS:

- Enlargement
- Enlarger
- Negative Carrier
- Crop
- Burn-in
- Dodge
- Contrast
- Paper Grade
- Multi-grade
- Resin Coated
- Fiber Base
- Vignetting
- Paper Weight
- Safelight
- Paper Safe
- Matte
- Glossy

REFERENCES:

Minolta Corporation, Black & White Home Developing and Printing, New York, N.Y.: Doubleday & Co., 1982.

Paterson Products Limited, The Book of the Darkroom, Sherborne, England: Sawtells of Sherborne Limited, 1979.

REFERENCE: 4.7

MAJOR TITLE: Communication Technology

UNIT TITLE: Applications of Advanced Photographic Technology

MAJOR CONCEPT: Applications of advanced technology are constantly being integrated into the photographic processes.

TOPICS:

1. Automatic Metering Systems
2. Auto Exposure/Auto Focus Cameras
3. Dedicated Flash
4. Fiber Optics
5. Computerized Print Processing
6. Digital Image Processing
7. Digital Coded Film
8. Holography (Laser)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify five specific applications of advanced photographic technology (dedicated flash, auto exposure/auto focus cameras, digital coded film, digital image processing, and holography) in the photographic industry.
2. Describe how an automatic metering system in a camera operates.
3. Describe how a dedicated flash unit operates.
4. Illustrate and discuss the basic concept of digital image processing.

CORE INSTRUCTIONAL ACTIVITIES:

1. Research current photography periodicals (Peterson's Photographic, Modern Photography, Popular Photography, trade journals, etc.) for applications of advanced technology in photography. Select a minimum of five applications (listed above in behavioral objective number one); record your findings and make a brief report to the class.
2. Construct a scrapbook of photographs, articles, advertisements, and other clippings which pertain to applications of advanced technology in photography.
3. Design and present a bulletin board on "Advanced Technology in Photography". (Class Project)
4. Expose a roll of film using an automatic computerized SLR. Expose frames in all modes (manual, aperture preferred, shutter preferred, fully automatic, and automatic flash modes). Expose the film under all lighting conditions. Be sure to include backlit situations, heavy shadows, light (reflective) subject matter, and compositions with high contrast. Process and contact the film.
5. Examine the contact sheet and analyze exposures. Describe the interaction of the exposure meter with the camera in the various available light modes. Describe how the dedicated flash works during the automatic flash mode. Describe any weaknesses of the system which you observe and indicate how these may be overcome.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Use a computer and a graphic printing program to simulate digital image processing. Discuss the digital image process. Describe how the information (pixels and dots produced on the dot matrix printer) is encoded, stored, edited, and processed.
2. Use a computer aided drafting station (CAD) to simulate digital image processing. Complete a basic drawing by locating individual points using cartesian coordinates. Describe how this method of drawing relates to digital image processing.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Scissors
Film Processing Equipment (see 3.1.6)
Darkroom Equipment (see 3.1.7)
Automatic SLR Camera with Lens
Dedicated Flash Unit
Stapler

MATERIALS/CORE:

Periodicals
Film
Film Processing Materials (see 3.1.6)
Print Processing Materials (see 3.1.7)
Bulletin Board Paper
Staples
Stencils (letters)

TOOLS AND EQUIPMENT/ADVANCED:

Computer Aided Drafting (CAD) System

MATERIALS/ADVANCED:

PRINT SHOP software

APPLICATION OF TERMS:

Automatic Metering Systems
Digital
Digital Coded Film
Digital Image Processing
Computerized Print Processing
Dedicated Flash
Auto-focusing
Fiber Optics
Dot Matrix
Cartesian Coordinates
Hologram
Holography
Laser
Mode
Aperture Preferred
Shutter Preferred
Backlit
Pixels
Encode

REFERENCES:

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

Minolta Corporation, Flash Photography, New York, N.Y.: Doubleday & Company, Inc., 1982.

REFERENCE: 5.0

MAJOR TITLE: Communication Technology

UNIT TITLE: Introduction to Electronic Communications

MAJOR CONCEPT: Electronic Communication is essential in today's society.

TOPICS:

1. History
2. Impact on Society
3. Key Elements of a System
4. Characteristics/Limitations

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Analyze the major changes that electronic communication has had on society in the last 40 years.
2. Build a display of an electronic communications system or chart the evolution of an electronic communications system.
3. Define and discuss the given terms associated with the key elements of a communication system.

CORE INSTRUCTIONAL ACTIVITIES:

1. Build a display of an electronic communication system.
2. Conduct an informal interview. Contact elderly people to better understand the impact T.V. (or computers...) has had on the world as seen through their eyes.
3. Compile an electronic communications notebook depicting various applications of electronic communications systems. (Keep the notebook up-to-date throughout the course with newspaper articles, etc.).
4. Make a poster/bulletin board/display charting the evolution of electronic communications or a specific electronic communications system.
5. Identify and/or describe the following key elements of an electronic communication system:
   - sender
   - channel
   - feedback
   - transmit
   - receive
   - input
   - encode
   - receiver
   - process
   - noise
   - decode
   - output

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Discuss how lives today would be different if we did not have electronic communication.
2. Evaluate which of the various communication techniques have grown or lost importance in the past forty years. This may be done through a questionnaire using the following sample forms of communication:
   1. Personal letters
   2. Long-distance telephone calls
   3. Radio listening
   4. Television viewing
   5. Reading of printed material (i.e. books, newspapers, magazines)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Overhead projector
Chalkboard

MATERIALS/CORE:

Teacher-made transparencies
Poster paper

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Examples of bar or pie chart

APPLICATION OF TERMS:

Sender
Decoder
Noise
Receive
Process
Receiver
Feedback
Encode
Bar/Pie Graph
Output
Encoder
Transmit
Channel
Input
Electronic

REFERENCES:

REFERENCE: 5.1

MAJOR TITLE: Communication Technology

UNIT TITLE: One Way Telecommunications Systems

MAJOR CONCEPT: One way telecommunication is the use of radio and TV signals to convey information to the public.

TOPICS:

1. Radio
2. Television
3. Sound, Transmission, Reception
4. Programming Elements

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify and explain the function of a TV receiver/transmitter, including its subsystems, according to teacher approved guidelines.
2. Differentiate between AM and FM.
3. Identify, list, and describe the various radio programming elements (i.e. music, news).
4. Develop a programming clock for an identified broadcasting time segment and evaluate the information contained in it (pie chart).
5. Identify five careers in the radio/TV broadcasting industry.
6. Describe technical characteristics of radio wave transmission that affect programming decisions.

CORE INSTRUCTIONAL ACTIVITIES:

1. Describe the basic differences between AM and FM, and discuss the advantages and disadvantages of each.
2. Construct a block diagram of a transmitter and receiver.
3. From teacher-made programming clock, analyze a 10 minute segment and record the programming elements using the coding developed in class.
4. Identify a code system (symbols and colors) for all the identified programming elements (music, news, conversation, commercials, talk nets, and weather reports).
5. Identify the clearest AM stations in the area and discuss the conditions which can effect reception (i.e. power lines, inside, weather conditions).
6. Build a crystal radio receiver.
7. Trace the path of sound waves from the transmission of sound, at a transmission/broadcasting station, to the reception of the sound waves by the receiver, and identify how these sound waves are transmitted through the use of the transmitter/receiver subsystems.
8. Experiment with radio reception by inserting various kinds of materials between the radio and the broadcasting station. (wood, solid metal, glass, plastic, tinsel, fabric, etc.) Record the results and discuss the effects.
9. Experiment with various radio/sound transmission circuits and transmit information using the circuit. (Radio Shack manufactures a 160 or 201 project in one kit...that satisfies the equipment need of this activity.)

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Construct a radio from given components using a schematic diagram.
2. Arrange an investigative report on asbestos in a school building.
3. Produce a one-way communication system (audio or video) and record the responses of those receiving the information and identify whether the message was clearly communicated.
4. Define frequency and bandwidth.
5. Discuss any technical reasons behind programming differences between radio bands AM and FM. (AM-news, sports, broadcasts..., FM-Hi-quality, stereo..)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Video Camera
Monitor/TV
VCR/VTR
Tape Recorder with Mixer and Microphone(s)
Communication Module Including Radio and TV Assembly Kits/Circuits
Radio Shack's 160 or 201 Projects in One Kit
Stop Watch

MATERIALS/CORE:

Chalkboard
Overhead
Video and Cassette Tape
Poster Board
Cardboard
Colored Markers

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATION OF TERMS:

Wave
Mix Down
Tuner
Audio Signal
Lacquer
Speaker
Transmitter Antenna
Tape Recorder
Track
Sky Waves
Cellular Telephone System
Antenna
Radio Wave
Master Tape
Amplifier
Transmitter
Stamper
Recording Industry
Ground Waves
Record Player
Mixing Board
Vidicon Tube

- Microphone
- Scanning
- Videocassette Recorder (VCR)
- Closed Circuit TV
- Amplitude Modulation
- Crystal Radio
- Transistor
- Microchip
- Satellite Dish
- Cable Vision
- Cathode Ray Tube
- Videodisk
- Frequency Modulation
- Transistor Radio
- Integrated Circuit

REFERENCE:

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

NOTES

REFERENCE: 5.2

MAJOR TITLE: Communication Technology

UNIT TITLE: Two-Way Telecommunications Systems

MAJOR CONCEPT: Two-way telecommunications is the ability to transmit and receive information.

TOPICS:

1. Telephone
2. Telegraph
3. Teletype
4. Two Way Radio
5. Careers

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain the basic elements of a two-way communication system (input, process, output, (feedback))
2. Identify and explain the use of the basic components of a telephone, telegraph, teletype, and two-way radio.
3. Construct and demonstrate the use of a basic two-way communication system. (Telephone, Telegraph, Teletype, Two-Way Radio)
4. Differentiate between a regular telephone and a mobile telephone (cellular telephone) or between a wired and wireless two-way communications system.
5. Simulate teletype operations with a computer, printer, and modem.
6. Categorize a given list of two-way telecommunication careers and/or two-way radio careers under the titles: telephone, telegraph and teletype. Identify which of these careers have "carry-over capabilities". (e.g. an electrical repairman. Could he/she be placed under more than one category?)
7. Construct a basic telegraph machine and communicate a message.

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify the elements of input, process, and output (and feedback) in a given two-way communication system.
2. Role play the proper procedures to call for information or to call in an emergency on a CB radio.
3. Identify and explain the use of the basic components of a given telephone, telegraph, teletype, and two-way radio.
4. Construct a two-way communication system which will transmit a message over a 30 foot distance. (Using a bag of miscellaneous items)
5. Obtain information, through a modem and the use of a computer and printer, from the ITEA computer network or some other network to simulate teletype.
6. Categorize a given list of two-way communications careers by pasting or writing them in a notebook under the topics: telephone, telegraph, teletype, and two-way radio.

7. Use sheets of metal, soda cans, paper clips, wire, wood, nails, lamps, bells, batteries, other assorted items, or a breadboard and various electronic components to create a functionable telegraph. Transmit and receive at least five lines of information. (A coding system may have to be worked out.)
8. Use the SOUTH CAROLINA OCCUPATIONAL INFORMATION SYSTEM (S.C.O.I.S.) to simulate communication by teletype.
9. Determine the most cost effective time for phone calls. Gather information on the cost of long distance phone calls made at different time periods during the day/week (morning, afternoon, evening, night, weekdays, weekends, holidays, etc.), from a local telephone company. Show evidence of the research on a diagram/chart.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Send a message using morse code on a student-made telegraph.
2. Identify terms used when talking on a CB radio.
3. Demonstrate the proper use of a CB radio.
4. Design, construct and use a two-way communication system. (Using an electronic communication module)
5. Identify laws and regulations dealing with two-way communication systems.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer
Printer
Modem
General Lab Handtools
Telephone
CB or Ham Radio

MATERIALS/CORE:

Printing Paper
Computer Software
Assorted Electronic Parts including: wire, buzzers, bells, paper clips, screws
Resource Books on CB and Ham Operation
Prepared List of Careers

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATION OF TERMS:

Mouthpiece
Connecting Mechanism
Receiver
Waves
Electromagnetic Energy
Earpiece
Transmitter
Cellular Telephone
Audio Signal
Transmitting Antenna

Electromechanical Field
Tuner
Speaker
Carbon Granules
Coils
Computer
Electromagnet
Antenna
Amplifier
Switching Office
Diaphragm
Modem
Printer

REFERENCE:

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

NOTES

REFERENCE: 5.3

MAJOR TITLE: Communication Technology

UNIT TITLE: Fiber Optics in Communications

MAJOR CONCEPT: Fiber optics is a method of transferring light signals through optical fiber(s).

TOPICS:

1. Light Sources
2. Processes
3. Products
4. Optical Materials

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain the principle of a fiber optics communications system.
2. Discuss the advantages/disadvantages of a fiber optic communication system.
3. Identify at least two light sources that may be used in fiber optics.
4. Arrange the following processes in proper order and explain the function of each: a) Design, b) Transmitting, c) Decoding, d) Encoding, and e) Receiving.
5. Select one of the following product areas, and research how fiber optics is being used in the area: a) Entertainment, b) Information/Data, and c) Detection.
6. Make and use a fiber optics communication system.

CORE INSTRUCTIONAL ACTIVITIES:

1. After identifying at least 5 forms of light, (sun, campfire, torch, candle, oil lamp, lantern, incandescent lamp, neon lamp, semiconductor lamp, radioactive substances, LASER), use a light meter to analyze various fibers (polished Plexiglass, glass tubes, etc.), in combination with various forms of light to identify the "best" combination of light and "carrying agent" with various light sources; document the results of the findings.
2. Identify methods that are used in processing information in a Fiber Optics Communication system. (i.e.-light conversion, efficiency, maintenance, safety, lifetime, and portability.)
3. Discuss and do experiments to show why the following are advantages of using a Fiber Optic system:
   a) withstanding more abuse than a copper wire of equal size,
   b) less weight than copper wires,
   c) size advantage,
   d) able to withstand all kinds of weather,
   e) is immune to most erosive and corrosive elements,
   f) can carry high volume of different signals.
4. Develop a communication system with the apparatus in number one(1).
5. Draw a poster/diagram of a fiber optic system.
6. Diagram the ways that fiber optics can be used in entertainment, information/data, and/or detection.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Identify the encoding, transmitting, decoding, and receiving elements of a fiber optic system.
2. Experiment and create a usable fiber optic system using an experimenter board, an emitter/detector and fiber cable package (i.e. Radio Shack's) and other necessary components and materials.
3. Discuss how light is transmitted through the fiber optic cable, even when bent, looped, or "tied in a loose knot".
4. Research a particular area dealing with fiber optics or with materials/components used in a fiber optic system.
5. Use a strip heater to bend Acrylic (Plexiglass) to various shapes and sizes. Transmit light through the polished edges, after taping or covering all other surfaces, and record the experimental data. (Record which shapes caused the most problems in transmitting)
6. Graph or record the differences in using a laser as opposed to an LED transmitted light source. (Use a multimeter/oscilloscope to observe the effects in the circuit)
7. Use the computer to analyze and document the experimental data from experiments dealing with fiber optics.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

LASER
General Lab Tools
Fiber Optics Module/Kit
Computer System
Multimeter (used to measure Volts, Ohms, and Amps)
Oscilloscope

MATERIALS/CORE:

Electronics Experimenter Kit (eg.-Radio Shack's 201 or 160 project in one kit)
Assorted electronic components (including LED's, transistors, speakers, diodes, resistors, transformers, fiber optic cable, emitter/detector, wire)
Flashlight
Acrylic (various sizes)
Candles
Incandescent Lamp
Neon Lamp
Software dealing with fiber optics
1" diameter Clear Acrylic Plastic

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATION OF TERMS:

- Fiber
- Emitter
- Incandescent
- Transmitter
- Decoding
- Transformer
- Circuit Board
- Immune
- Maintenance
- Optic
- Detector
- Neon
- Receiver
- Resistor
- Transistor
- LASER
- Radioactive
- Efficiency
- Fiber Optic
- Transducer
- LED
- Encoding
- Diode
- Semiconductor
- Acrylic
- Portability
- Conversion

REFERENCES:

Tischler, Morris, Optoelectronics A Text-Lab Manual, McGraw-Hill Book Company, 1986.

Understanding Optronics, Developed and Published by Texas Instruments Learning Center, P.O. Box 225012 MS-54, Dallas, TX 75265.

NOTES

REFERENCE: 5.4

MAJOR TITLE: Communication Technology

UNIT TITLE: Satellites in Communications

MAJOR CONCEPT: A communications satellite is a man-made object orbiting in space.

TOPICS:

1. Classification of Communication Satellites
2. Purpose
3. Transmission/Reception

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Classify satellites by type and explain how they are used in communications (weather, communication, navigation, scientific, military, mapping, environmental monitoring).
2. Construct a model of a communications satellite.
3. Simulate transmitting and receiving images from communication satellites.

CORE INSTRUCTIONAL ACTIVITIES:

1. Classify different types of communication satellites (from pictures or diagrams/drawings) and explain the major differences and uses of each. Examples: weather, communication, navigation, scientific, or military.
2. Use styrofoam/paper mache' or some other material to construct a satellite. Connect this to a globe to show (geo-syncronous) orbit.
3. Simulate transmitting and receiving images from a communications satellite. One student shall be the transmitter (satellite) and the rest of the class shall be the receiver (dish). The "transmitter" uses an overhead projector, clear acetate (with a graph drawn on it), and a picture to slide under the acetate. The "receivers" will have a paper graph the same size as the one of the "transmitter". The "transmitter" will "read" each square or "pixel" on the graph (what the camera lens "sees"), and transmit this information to the receivers, whether the square is white, dull white, light gray, medium gray, dark gray, or black. The transmitter continues throughout the whole picture until all the pixels have been transmitted and the receivers have drawn an exact replica.
4. Research, discuss, and/or simulate how communications satellites send radio messages, telephone calls, and television programs between distant parts of Earth, help pilots and sailors find their exact positions in all kinds of weather, measure the Earth's magnetic field, explore space galaxies measuring rays that never reach Earth, warn or guard against surprise missile attacks, or forecast and study weather.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Use a satellite dish to receive information on weather conditions or to receive images on a TV/monitor.
2. Diagram geo-synchronous orbit on poster board, and explain the principle of it.

3. Write to *Marshall Space Flight Center for satellite information and share the information with the class; or, request information on a particular satellite to use in a research report.
   *The address: George C. Marshall Space Flight Center
   Marshall Space Flight Center, Alabama 35812
   AC 205-453-0034
4. Embed a receiver/transmitter in a globe, suspended from a continuous loop clothes line, and simulate its movement/effect by sending and receiving signals to stations in the classroom.
5. Mount a flashlight on a "lazy susan" and spin the flashlight to simulate the transmission/relay of radio signals/information using a passive satellite. (NOTE: To perform the actual simulation a 3" by 3" pocket mirror is used to represent a passive satellite. The process involves the rotation of the "earth station" and as it rotates past the "satellite" mirror, it will reflect the light beam back to the "earth receiving station." When the light beam strikes the phototransistor it will signal the receipt of a "message" (by sounding a buzzer)). *Refer to Reference list: The Technology Teacher, Nov. 1985.
6. Visit a local vendor of "Satellite Dishes" and share the information and experiences with the class.
7. Explain how the Space Shuttle is used to maintain satellites in space.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Overhead Projector/Screen
General Lab Tools
Plywood
Pocket Mirror
Flashlight
"Lazy Susan"

MATERIALS/CORE:

Paper Mache' Material
Globe
Transparency
Styrofoam
Poster Board
Graph Paper
Electronic Components to Make Transmitter/Receiver Device

TOOLS AND EQUIPMENT/ADVANCED:

Same as core, but including a satellite dish and a computer system

MATERIALS/ADVANCED:

Same

APPLICATION OF TERMS:

- Satellite
- Orbit
- Navigation
- Echo Balloons
- Reconnaissance
- Magnetometer
- Geophysical
- Satellite Dish
- Moon
- Artificial
- Decay
- Orbiting Observatories
- Solar
- Astronomical

REFERENCES:

National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22151.

Ritz, John M., et.al., "Satellite Communication", The Technology Teacher, International Technology Education Association, 1914 Association Drive, Reston, VA 22091. (Tidewater Technology Associates (T^{2}A), an educational consulting group-7045 Doummmar Drive, Norfolk, VA 23518.)

Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

U.S. Department of Commerce, National Technical Information Service, Springfield, VA 22161.

NOTES

REFERENCE: 5.5

MAJOR TITLE: Communication Technology

UNIT TITLE: Lasers in Communications

MAJOR CONCEPT: The study of Laser Technology is the study of Light Amplification by Stimulated Emission of Radiation.

TOPICS:
1. Laser Modulation
2. Effects of Distance on Laser Light
3. Effects of Noise on Laser Light
4. Effects of Temperature on Laser Light
5. Holography

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Explain how Laser light is created.
2. Describe how Laser light is used to transmit information.
3. List the components needed for Laser transmission of information.
4. Describe and demonstrate the effects of distance, noise and temperature on a Laser beam.
5. Discuss at least five uses of holograms and propose at least two future uses of holograms. (e.g. entertainment, medical – projecting the information received from ultrasound to avoid exploratory surgery, photography, motion picture production, identification)
6. Create a hologram and explain the basic concepts of how a hologram is made.
7. Describe, and demonstrate the function of the three main parts of a Laser (power source or excitation mechanism, active medium, and feedback mechanism).

CORE INSTRUCTIONAL ACTIVITIES:
1. Measure the maximum distances that the Laser and receiver can be apart.
2. In groups, design activities and experiment with changing the direction of a Laser beam, Laser beam divergence, scattering, beam visibility in air, splitting a Laser beam, diffraction, knife edge and using proper safety precautions. (Never look directly into the beam).
3. Record the results of misaligning the Laser beam from the receiver.
4. Record the quality of sound coming from the speaker as the following noise elements are inserted into the path of the laser:
   a) sheet of translucent paper
   b) chalk dust
   c) atomized water
   d) glass
   e) colored filters
5. Discuss the reasons for using mirrors in Laser Technology.
6. Explain the law of reflection.
7. Identify the necessary components for transmitting information with a Laser.
8. Create a hologram using Kodak's Package on Laser Technology.

9. Identify and explain the concepts used in the making of a hologram.
10. Chart at least five past/present applications of holograms and at least two future applications.
11. Project light from a flashlight and a Laser into a prism, and compare the difference between the many colors that form when both types of light combine.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Hook up a dual channel oscilliscope to the voice input of the Laser and the other channel to the voice output of the receiver and measure the effects of the change in distance and noise on the Laser beam.
2. Explain how to overcome weather problems when using a Laser.
3. Explain the reasons for using a front surface mirror versus a back surface mirror.
4. Identify applications of Laser in industry.
5. Measure the size of a Laser beam when projected onto a piece of white poster board.
6. Shine the laser at the substage mirror and remove the eyepiece of a microscope to use it as a microprojector. A screen placed at the focal plane of the objective lens will produce an enlarged image of the specimen on the stage so it can be viewed by several people simultaneously.
7. Describe the difference between the Laser light used in communication systems and the Laser light used for welding, drilling, measuring, cutting and heat treating in industry.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

LASER Kit/Package including: Laser, Mirrors, Microphone Accessories,
Detector, Amplifier
Flashlight
Microscope
Oscilloscope

MATERIALS/CORE:

Acrylic Sheets of Various Thicknesses
Chalk (dust), Water and Spray/Mist Bottle, Poster Board
Flashlight
Projection Screen
Glass, Filters
Translucent Paper
Holograph Film Developing Kit

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATION OF TERMS:

LASER
Variable Distance
Receiver
Microphone
Photo-Optic Detector
Amplifier

REFERENCES:

Balistreri, Jerry P., "LASER TECHNOLOGY: Introducing Students to Laser Technology for Under $350", The Technology Teacher, Reston, VA: ITEA Sept./Oct., 1985, page 23.

Boaraiko, Allen A., "A Splendid Light, LASERS," National Geographic, Vol. 165, No. 3, March 1984, pages 335-337.

Brodhead-Garrett Co., 4560 East 71st Street, Cleveland, OH 44105.

Burroughs, William, Lasers, Warwick Press, 1982.

Campbell, J. C., and Ritchey, T. A., (1983) "Laser Holography for the Industrial Arts Visual Communications Laboratories." Unpublished manuscript, Millersville University, Department of Industry and Technology.

Caulfield, H. J. (1984, March). "The Wonder of Holography." National Geographic, pages 364-377.

Eastman Kodak Company, Department 841, 343 State Street, Rochester, N.Y. 14650. (Ask for the educational catalog. You may order @ 10 pamphlets/booklets a month for only the cost of the postage. This is a worthwhile resource.)

Edelson, Edward, "The Bizarre New World of Holography", Popular Science, page 87.

Edmund Scientific, 101 E. Gloucester Pike, Barrington, NJ 08807, 609/547-3488.

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McKie, Robin, The Electronic Revolution, Laser, New York: Franklin Watts, 1983.

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Schlegel, R. D. (1985). "Reflection Laser Holography." Unpublished manuscript, Millersville University, Department of Industry and Technology.

Schlegel, Ronald D., "LASER HOLOGRAPHY High Tech with High Potential for Learning Activities", The Technology Teacher, Reston, VA: ITEA May/June 1986, page 23.

Thomas Edison Foundation, 21,000 W. Ten Mile Rd., Southfield, MI 48075, 313/354-3003.

Unterseher, F., Hansen, J., and Schlesinger, B. (1982). Holography Handbook, Berkely, CA: Ross Books.

REFERENCE: 5.6

MAJOR TITLE: Communication Technology

UNIT TITLE: Microwave Communications

MAJOR CONCEPT: Microwave communication is the use of Super High Frequency (SHF) radio waves to transmit pictures and printed matter at great speed.

TOPICS:

1. Wave length (1 mm. to 30 cm.)
2. Characteristics of microwave
   1.1 Similarity to light
   1.2 Advantages over light
3. Radar (Radio Detection and Ranging)
4. Satellite communications

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Demonstrate a wave form.
2. Compare AM and FM radio frequency wave length to microwave.
3. Demonstrate the characteristics of microwave with visible light waves. (see Core Activity #3)
4. Identify applications of microwave in communications. e.g. Point to point relay (Teletext, Videotext, TV, telephone), Satellite link (TV, telephone, weather, military, business), Radar (Police, aircraft, weather, military).
5. Explain how radar detects objects and determines range.
6. Identify the components needed for a microwave communication link with a satellite. (Ground Transmitter (uplink), Geosyncronous Orbiting Satellite, Ground Receiver (downlink).)

CORE INSTRUCTIONAL ACTIVITIES:

1. Fasten one end of a five meter rope to a stationary object at waist level. Hold the other end of the rope so that the rope is off the floor but not taunt and demonstrate wave forms.
2. Choose your favorite AM or FM radio station. Use the formula: Wavelength = 300/Radio Frequency in MHz to compute the wavelength of the carrier wave signal transmitted.
3. Use a light source to demonstrate characteristics of microwave. Microwaves travel at the speed of light. Simulate how microwaves travel at 300 million meters/second using a light in a darkened room. Microwaves travel in a straight line - (In a darkened room hold a ball in front of a light source and observe that only one side of the ball is illuminated.) Microwaves can be reflected - (use a mirror to demonstrate reflection.) They may be concentrated - (use a magnifying glass to show how light rays collect and concentrat at a point.)
4. Use a rubber ball to demonstrate the principles radar uses to detect objects and determine range. First, throw the ball with nothing in the way - the ball will not return. Next, throw the ball at an object - the ball will return. Ranging is accomplished by determining the time the ball

takes to go out and back. Demonstrate by throwing the ball at the same speed at objects that are at different ranges. Calculate the time it takes the ball to travel out and back for each example. This will indicate range.

5. Use a passing automobile with its horn blowing to illustrate the doppler effect or frequency shift.
6. Explain how a television signal is transmitted from the studio to a home satellite dish.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Demonstrate wave forms and how a reflector at the correct distance from the source intensifies and concentrates the wave by using a pan of water, a float, string, a weight, and a support stick. Tie the string to the weight and the stick. Place the float near one end of the pan of water. Bob the weight in the water to produce waves. Use the edge and corners of the pan as a reflector and determine the different motions of the float.
2. Research the number and location of geosynchronous orbiting satellites. Locate their ground position on a globe and determine their useful range.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Five meter rope
Light source with reflector
Rubber ball
Magnifying glass

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

Pan for water
Stick
Weighted fishing float

MATERIALS/ADVANCED:

Water

APPLICATION OF TERMS:

Geosynchronous
Pulsed Radar
Cycles Per Second
High Frequency
Uplink
Phase Shift
Waveguide
Repeaters
Videotext
Super High Frequency
Low Frequency
Doppler
Satellite Dish
Ultra High Frequency
Downlink
Coaxial
Teletext

REFERENCES:

Seymour, Richard D., Ritz, John M., and Cloghessy, Florence A., Exploring Communications, The Goodhart-Willcox Co., Inc., 1987.

REFERENCE: 5.7

MAJOR TITLE: Communication Technology

UNIT TITLE: Introduction to Computers

MAJOR CONCEPT: Computers are essential tools in our technological world.

TOPICS:

1. History & Development
2. Types of Computers
3. Basic Operation
4. Booting The System

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify the five generations of computers. (Vacuum Tubes, Transistors, Integrated Circuits, Micro-chip, Super Computer)
2. Identify three types of computers. (Main-Mini-Micro)
3. Identify the basic components of a computer system. (Monitor, Keyboard, Disk Drive, Processor, Printer)
4. Load and operate the system.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the development of the five generations of computers. (Vacuum Tubes, Transistors, Integrated Circuits, Micro-chip, Super Computer)
2. Discuss three types of computers and their uses and applications. (Main-Mini-Micro)
3. Identify the basic parts of a computer system. (Monitor, Keyboard, Disk Drive, Processor, Printer)
4. Boot the system with a disk. (cold boot, warm boot)
5. Process information using a basic word processing program.
6. Print original designs using a graphic printing program.
7. Use the simulation program OREGON TRAIL (computer software).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Word process information using the an advanced word processing program.
2. Design a car utilizing the CAR BUILDER (computer software) program.
3. Print the results of the simulation from the CAR BUILDER program.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer	Printer
Disk Drive	Monitor

MATERIALS/CORE:

Computer Software
Paper
Ribbons

TOOLS AND EQUIPMENT/ADVANCED:

Same as core

MATERIALS/ADVANCED:

Computer Software (BANKSTREET WRITER, CAR BUILDER)

APPLICATION OF TERMS:

- DOS
- CPU
- Data
- ROM
- Warm Boot
- User Friendly
- Programs
- Vacuum Tube
- Supercomputer
- Microcomputer
- Printer
- Monitor
- Memory
- Program
- Cold Boot
- Artificial Intelligence
- Storage
- Integrated Circuit
- Main-frame Computer
- Disk Drive
- Input
- RAM
- Output
- Processing
- Keyboard
- Transistor
- Microchip
- Minicomputer

REFERENCES:

Computer Software; Any computer store or check for similar MECC programs in your district.

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

REFERENCE: 5.8

MAJOR TITLE: Communication Technology

UNIT TITLE: Computer Software and Hardware

MAJOR CONCEPT: The computer consists of hardware, that uses software to process information.

TOPICS:

1. Input, Process, Storage, and Output Devices
2. Memory
3. Buying and Copying Software

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Demonstrate the use of at least two of the following input devices: keyboard, joystick, mouse, touch tablet, and a light pen.
2. Draw a block diagram of the basic function and makeup of a microprocessor.
3. Demonstrate the use of at least one of the following: magnetic storage system/devices: floppy disk drive, hard disk drive, interactive video laser disk, or cassette tape.
4. Demonstrate the use of at least two of the following output devices: monitor, printer (dot matrix, daisy wheel, thermal, plotter), and a modem.
5. Compare and contrast the differences, in quality and permanence of print, between a dot matrix, daisy wheel, thermal and plotter printers.
6. Explain how magnetic storage systems work.
7. Properly handle a floppy diskette.
8. Identify various peripherals and their uses.
9. Describe how to purchase and copy software.
10. Explain applications of software in education.

CORE INSTRUCTIONAL ACTIVITIES:

1. Build a cardboard model of a computer large enough to walk through. Label all major parts. Use a string to trace a single piece of date through all the components.
2. Look at a microchip under a microscope. Draw and describe what you see.
3. Cut the envelope off a floppy diskette. Examine the rings under a microscope or strong magnifying glass. Note how the disk rings differ from those on a phonograph record.
4. On a cassette recorder, play a cassette tape that has data stored on it. Report on what is heard.
5. Use at least two of the following input devices to input data into the computer: keyboard, joystick, mouse, touch tablet, and a light pen.
6. Draw a block diagram of the basic function and makeup of a microprocessor.

7. Use at least one of the following magnetic storage system/devices to store information that you input into the computer from activity number five above: floppy disk drive, hard disk drive, interactive video laser disk, or cassette tape.
8. Use at least two of the following devices to observe output from the computer: monitor, printer (dot matrix, daisy wheel, thermal, plotter), and/or a modem.
9. Compare and contrast the differences in quality and permanence of print, between a dot matrix, daisy wheel, thermal and plotter printers.
10. Explain how magnetic storage systems work and chart the path of information to and from the storage system.
11. Properly handle a floppy diskette.
12. Properly connect various peripherals to the computer.
13. Use a system master or other utilities disk to make a backup copy of a given disk.
14. Use the BASIC commands Catalog, and Load and Save to locate and copy a specific program from a given disk.
15. Format/Initialize a blank disk using a BASIC program and the command "INIT HELLO".
16. Explain the term "Public Domain Software".
17. Use a computer magazine and locate various software distributers. Write the names of the various distributors and compare the prices each distributor indicates for a given software package.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Visit a computer store. Compare the same computerized games played on different brands of computers. Report on your findings.
2. Use a word processing program to produce a form letter to advertise an upcoming school event.
3. Chart/trace the development of the microchip.
4. Use a computer to chart the results of the findings in core activity number seventeen (17).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer System including: two disk drives, 128K, RAM,
keyboard, CPU, monitor, and printer/plotter, modem, joystick, mouse, touch tablet, light pen
Computer paper
Cassette Recorder

MATERIALS/CORE:

- Floppy Disks (blank)
  - System Master/Utilities Disk
- Teacher made instruction sheet
  - cassette tape(s)
  - transistors, microchips, vacuum
- Tubes
- Cardboard
- Computer Magazines

TOOLS AND EQUIPMENT/ADVANCED:

- Same as core

MATERIALS/ADVANCED:

- Software packages

APPLICATION OF TERMS:

- Hardware
- Monitor
- Microprocessor
- Transistor
- Computer terminals
- Dot Matrix Printers
- Kilobyte (K)
- Input Device
- Letter Quality
- Plotter
- Membrane Keyboard
- Modem
- Disk
- Cursor
- Acoustic Coupler Modem
- Disk Drive
- Touch Tablet
- Memory
- Byte
- Binary Code
- Program
- Output
- Master Disk
- Copy Protected
- Light Pen
- Peripheral
- CRT
- Printer
- Microchips
- Silicon
- Daisy Wheel Printers
- Random Access Memory (RAM)
- Read Only Memory (ROM)
- Thermal Printer
- Floppy diskette
- Joystick
- Database
- Cassette Tapes
- Mouse
- Direct Connect Modem
- Read/Write Head
- Software
- Bit
- Data
- Processing
- Storage
- Backup

REFERENCES:

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

NOTES

REFERENCE: 5.9

MAJOR TITLE: Communication Technology

UNIT TITLE: Computer Theory

MAJOR CONCEPT: Computer programming and languages make the computer a valuable tool in industrial technology.

TOPICS:

1. Process (Input, Process, Storage, Output)
2. Binary Code
3. Initializing or Formatting a Disk
4. Programming Languages (PASCAL, COBOL, FORTRAN, BASIC, LOGO)
5. Flow Charts
6. Programming Computers

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify processing. (Input, Process, Storage, Output)
2. Count using the binary code.
3. Translate a binary code to a number.
4. Initialize a disk to store a program.
5. Identify five programming languages. (PASCAL, COBOL, FORTRAN, BASIC, LOGO)
6. Load BASIC from ROM into the microprocessor.
7. Learn the BASIC commands and run a BASIC program.
8. Run a graphic program from a LOGO tutorial program.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss computer processing. (Input, Process, Storage, output)
2. Discuss the binary code to show how a letter is assigned to a binary number and learn to count using the binary code.
3. Translate a binary code into a number.
4. Discuss initializing a disk pointing out that the disk will be erased. (It divides the disk into tracks, sectors, and blocks; and installs the DISK OPERATING SYSTEM on the disk.)
5. Initialize the disk by booting the disk; type in a short program:

   ```
   sample    10 HOME
             20 Print "THIS IS MY DISK"
             30 Print "July 9, 1987"
             40 END
   ```

   and type INIT HELLO.
6. Load BASIC from ROM into the computer.
7. Type a BASIC PROGRAM into the computer from a teacher prepared worksheet.
8. Save the program on the initialized disk by typing "SAVE CLEMSON". (the program name)
9. Load the program from the data disk into the computer by booting the disk and typing "LOAD CLEMSON".
10. Run the program by typing RUN CLEMSON.

11. Discuss the flow chart method of writing a program in BASIC using the CLEMSON program as an example.
12. Create graphics using a LOGO tutorial program.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Write a program in BASIC using the flowchart method.
2. Load the BASIC program into the computer, run it, and save it on a data disk.
3. Write your own program in LOGO to create a graphic idea.
4. Load the LOGO program into the computer and run it, and save it on a data disk.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer
Printer
Data Disk
Disk Drive
Monitor

MATERIALS/CORE:

Computer Paper
Paper

TOOLS AND EQUIPMENT/ADVANCED:

Same as core

MATERIALS/ADVANCED:

Same as core

APPLICATION OF TERMS:

Boot
DOS
Crash
Load
Sector
Catalog
LOGO
PASCAL
Hideturtle
Clearscreen
Back
Pendown
Warm Boot
Disk Drive
List
Return
File
Error Message, I/O
FORTRAN
Clear
Showturtle
Left
Forward
Procedures
Diskette
Initialize
Run
Track
Block
BASIC
COBOL
Home
Draw
Right
Penup
Primitives

REFERENCES:

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

REFERENCE: 5.10

MAJOR TITLE: Communication Technology

UNIT TITLE: Computer Applications and Impacts

MAJOR CONCEPT: The application of computer technology has had a major impact on society.

TOPICS:

1. Interface
2. Careers
3. Products
4. Economic
5. Political
6. Education

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Control a robotic arm, CNC milling machine, or other machine/equipment, using the computer as a control and monitoring device.
2. Describe some of the major uses of computers.
3. Use a Computer Aided Drafting (CAD) system to demonstrate the impact of computer technology and the speed at which designs can be made, stored, and/or manipulated with the use of computers.
4. Use a Computer Numeric Control (CNC) machine to show the possibility of increased productivity in manufacturing, as a result of computer technology.
5. Balance a checkbook with the computer to show the impact of computers in accounting and management.
6. In groups, discuss how computers have affected the way we work and the type of jobs we may have in the future. (eg.-Computer controlled equipment is eliminating many jobs that are often unpleasant, dirty, and, in many cases, unsafe. However, some new jobs have been created. The demand for electronic products such as computers and computer controlled equipment is creating new jobs (service and repair jobs).
7. Use a computer tutorial, drill and practice program.
8. Describe how computer technology has effected our economy.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss and demonstrate some of the everyday uses for a computer (e.g. budgeting, spreadsheets, database, word processing, games, entertainment, simulations, controlling).
2. Make a list of as many applications for a computer as you can find. Try to list at least 20 specific uses.
3. Use the *South Carolina Occupational Information System (S.C.O.I.S.) to find career opportunities in one of the following areas and type a "dummy" letter for an application for one of these interest areas using a computer (computer operators, computer programmers, systems

analysts, computer service technicians, electrical engineers, salesperson, manufacturer or computers.)

4. Using the appropriate hardware/software, interface a robotic arm, CNC milling machine, or other machine/equipment using the computer as a control and monitoring device. Describe how this use of computers (interfacing with machines and/or tools) provides a possibility of increased productivity in manufacturing, as a result of computer technology.
5. Use a Computer Aided Drafting (CAD) system to demonstrate the impact of computer technology and the speed at which designs can be made, stored, and/or manipulated with the use of computers.
6. Program and use a robot arm or Computer Numeric Control (CNC) machine to show the possibility of increased productivity in manufacturing, as a result of computer technology (interfacing with machines/tools).
7. Balance a checkbook with the computer to show the impact of computers in accounting and management.
8. In groups, discuss how computers have affected the way we work and the types of jobs we will have. (e.g. Computer controlled equipment is eliminating many jobs that are often unpleasant, dirty, and, in many cases, unsafe. However, some new jobs have been created. The demand for electronic products such as computers and computer controlled equipment is creating new jobs (service and repair jobs).)
9. Use a CAD system or appropriate software to plot a poster/banner depicting the various products produced by a computer or that has had a computer integrated somewhere in the process. (Stay within the bonds of a limited area such as: entertainment, detection/control, computations, data exchange.
10. Use a computer to write a magazine article, to publish in the classroom, describing how computers have affected politics. (eg.-the speed of processing information and how the press uses that speed to their advantage..., bugging systems and pirating information to gather information, and how politicians can feed the public information at a much faster rate than ever before through the use of the computer, modem, and satellite combinations.
11. Chart the sales of last year's computer hardware, software or computer related products and analyze the effect that these sales have had on our society. Document your findings on the computer and store the information on disk and/or print it.
12. Use a modem to request and receive information from the International Technology Education Association (ITEA) on the applications of computers in education. Print the requested information and post in the classroom or school lunch room.
13. In groups of two or more, use a computer and a graphic printing program to design a 8.5" by 11" sign, letterhead, or greeting card. After printing the design on the printer, each student will reproduce the design using simple drafting tools (pencil, ruler, triangle, T-square, and drawing board) to show the speed and reproductivity that computer technology has provided in electronic communication.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Examine whether more stringent regulations should be placed on the choice of software and hardware for the medical industry to avoid wrong diagnosis of diseases caused by "bugs" in the software or malfunctions in the hardware. Provide evidence of your position and provide possible solutions to overcome these possibilities.
2. Type a resume' on the computer using a word processing program. *Use a CAD system or appropriate software to graph/plot the increase in computer related jobs in the last 15 years.
3. Print and analyze results from an experiment using the Science Toolkit.
4. Use the computer to draw a block diagram on how the computer is used in Computer Aided walking and explain how the computer "communicates" with the body to assist in walking.
5. Design a computer application where artificial intelligence may be used in the future. Chart career possibilities in the area of artificial intelligence.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer system
Computer Aided Drafting (CAD) System
Computer Numeric Control (CNC) Lathe/Mill System

MATERIALS/CORE:

"Science Toolkit" software package
Computer paper
CAD software
CAM software
Wax, metal, wood, plastic, or other machinable material
Blank disks
Plotter pen set

TOOLS AND EQUIPMENT/ADVANCED:

same

MATERIALS/ADVANCED:

Same

APPLICATION OF TERMS:

Input
Memory
Program
Binary Code
User Friendly
Computer Programmers
Data
Processing
Output
Computer
CAD
Supercomputers

CAM
Systems Analysts
Computer Service Technicians
Byte
CNC
Computer Operators
Bit
Electrical Engineers
Artificial Intelligence

REFERENCES:

Broderbund, 17 Paul Drive, San Rafael, CA 94903-2101

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

*S.C.O.I.S. is a computer network system, used in South Carolina, to gather information on job opportunities, schools, job prerequisites, etc. Contact your principal or local school district for more information.

Xerox Educational Publications/Weekly Reader, Computer Software Division, 245 Long Hill Road, Middleton, CT 06457.

REFERENCE: 5.11

MAJOR TITLE: Communication Technology

UNIT TITLE: Audio/Video Production Planning

MAJOR CONCEPT: Careful planning, organizing and proper use of equipment is necessary to ensure that an audio/video production will flow easily and smoothly.

TOPICS:

1. Marketing Research
2. Program Planning
3. The Script
4. Production Preparation/Job Interviews
5. Audio/Video Equipment

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Conduct a market research to identify an audience's needs and attitudes to better prepare program content. (e.g. keep a diary of television viewing in the home for 3 to 7 days and compile the results OR research which students would like to purchase a school yearbook. Record whether you would be selling to majority girls/boys, young/old and which activities they enjoy the most, what types of programs they watch/listen to, favorite music/shows, etc., so that the broadcasting content can be better designed to communicate to the "big sale" group.)
2. Write a short radio and television script (to be produced in the following unit).
3. Identify the advantages/disadvantages of using video as opposed to using film in motion picture production.
4. Identify and explain the use of Audio/Video equipment and components.
5. Design a programming clock to identify the timing of the programming elements (news, commercials, music, etc.) that will be used in the audio/video production.
6. Identify, explain the responsibility of, and interview for, the given Audio/Video production jobs. (see Core Activity #5)
7. Design the set/stage for an Audio/Video Production.

CORE INSTRUCTIONAL ACTIVITIES:

1. Write a script for a 5 minute Talk Show, Game Show, and/or Commercial, containing both audio and video information (the words to be spoken, along with cues for music and sound effects, plus any special directions necessary for the program).
2. Write a script for a radio program. Use the left 1/3 of the paper to identify the speaker, music, and the sound effects, and the right 2/3 of the paper to identify what is to be said, what music is to be played, and what sound effects are to be used. Special instructions are placed in parentheses and typed in all capital letters. Music is underscored with a solid line, and sound effects are typed in all capital letters and underscored with a dashed line.

3. Identify and explain the function of the major components of a VCR system and cassette or reel-to-reel tape recording system.
4. Explain the advantages and disadvantages of using a video system as opposed to using film type motion picture process. Discuss such areas as: screen size, projection possibilities, speed or production, bulkiness, hardware, ease of use, handling of equipment and film/tape, loading and unloading film/tape, safety precautions, copying possibilities, and developing the image.
5. Identify and explain the responsibilities of the following jobs: Director, Assistant Director, Stage Manager, Set Designers, Set Crew, Cameraman, Assistant Cameraman, Switcher, Actors, Emcee, and Announcer. Interview (on tape) for the video production jobs.
6. Conduct a market research to identify an audience's needs and attitudes to better prepare program content. (e.g. keep a diary of television viewing in the home for 3 to 7 days and compile the results OR research which students would like to purchase a school yearbook. Record whether you would be selling to majority girls/boys, young/old and which activities they enjoy the most, what types of programs they watch/listen to, favorite music/shows, etc., so that the broadcasting content can be better designed to communicate to the "big sale" group)

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Use a computer, and software that can be used to produce drawings, and make a Storyboard (a type of television script that includes drawings to help explain the video information in the program, thus, outlining the programs' action with both pictures and written descriptions).
2. Produce a News broadcast with reports, (local, state, and school), some weather, interviews and sports, to show during homeroom in the school.
3. Demonstrate and explain the characteristics and effects of audio energy as it collides with a surface. Set up an experiment on a test bed, pointing a bell, with a mailing tube around it, toward the receiver (microphone). Have a reflector board set up at 90 degrees/perpendicular to the test bed. Angle the bell and receiver toward the reflector board at 15, 30, 45, 60, 75, and 90 degrees, respectively. Record the effects of various surfaces upon the reflection and refraction of audio energy (e.g. aluminum foil, white paper, black paper).
4. Use a computer to plot the readings from the experiment in number 10 using a different colored line for each transmitter setting.
5. Experiment to find the most efficient reflector shapes.
6. Use a computer aided design system to design the set/stage for an Audio/Video Production.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

A VCR system including: camera, video recorder, TV/monitor, video tapes
Record player
Tape recorder
Mixer, Jacks, Microphones
CAD System

MATERIALS/CORE:

Chalk
Transparencies
Poster Board
Markers
Paper/Pencils
Batteries
Video Tapes, Records, and Cassette Tapes

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATION OF TERMS:

Network
Zoom
Medium Shot (MS)
Full Shot (FS)
Commercials
Newscaster
Public Stations
Actors
On Camera (OC)
Market Research
Camera Operators
Voice Over (VO)
Director
Stage Manager
Announcer
Stage Hands
Commercial Production
Count Down
VCR
Graph Paper
Current
Close-Up (CU)
Affiliate
Storyboard
Disc Jockey
Angle Shot
Commercial Stations
Freeze Frame
Content Area
Actresses
Pan
Script
Tilt
Assistant Director
Cue Cards
Emcee
Set Design
Company
Fade-in (out)
Turntable
Tone Arm

REFERENCES:

Book, A. C. and Clary, N. D., The Radio and Television Commercial, Chicago, Ill.: Craing Books, 1978.

Communication Technology Curriculum Guide, Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Research and Development Section, 100 North First Street, Springfield, Illinois 62777, 1984.

Diamont, L. (ed), The Anatomy of a Television Commercial, New York: Hastings House, 1970.

Havenstein, A. D. and Bachmeyer, S. A., The World of Communications Visual Media, Bloomington, Il.: McKnight Publishing Co., 1974.

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

McMahan, H. W., How to Evaluate Your Own TV Commercial, East Greenwich, RI.: Weaver Publishing Co., 1973.

Ross, W. A., Best TV and Radio Commercials, New York: Hastings House Publishers, 1968.

REFERENCE: 5.12

MAJOR TITLE: Communication Technology

UNIT TITLE: Audio/Video Production

MAJOR CONCEPT: Careful planning, organizing, and proper use of equipment is necessary to ensure that an audio/video production will flow easily and smoothly.

TOPICS:

1. Audio/Video Instructions and Cues
2. Sound Effects
3. Audio/Video Equipment
4. Production and Set-up of Stage Design
5. Recording/Editing/Producing

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Demonstrate the proper use of Audio/Video instructions and cues.
2. Produce a master tape of sound effects to use in the Audio/Video production. (sounds can come from records and/or recordings from tape or "self made" sounds)
3. Produce both radio and television programs, using video tape, cassette/reel-to-reel recording tape or integrated video Laser disk.
4. Construct a stage/set for an Audio/Video Production.
5. Record, Edit, and Produce a 5 minute Talk Show, Game Show, and/or/with Commercial. (include sound special effects and sound effects as when appropriate.)

CORE INSTRUCTIONAL ACTIVITIES:

1. Use a VCR system and cassette or reel-to-reel tape recording system to produce a 5 minute Talk Show, Game Show, and/or Commercial.
2. Watch a television commercial and list as many video instructions as you can identify during the commercial.
3. Use a record player, mixer, microphone and tape recording equipment to produce a radio broadcast. (Play the broadcast over the intercom system at the school or even over the air at a local radio station to promote Industrial Technology Education.)
4. Interview (on tape) for video production jobs.
5. Use the proper hand signal to communicate the following Audio/Video instructions and cues: slow down, speed up, 30 seconds to go in the program, 5 minutes to go in the program, 1 minute to go in the program, cut, cannot hear, too loud, too soft, stretch out the program, too much time left in the program, too close to the microphone.
6. Use cardboard, plywood, shelving board and the necessary tools/equipment and materials to assemble and construct a set/stage for an audio/video production. NOTE: The set should be designed during the previous unit on production planning.

7. Use a reel-to-reel or cassette recorder to make a "master tape" to use during the audio/video production. The tape should include any music, noises or special sound effects needed for the production. A sound mixer will be most beneficial for this activity.
8. Use a video camera to demonstrate how to make simpler "special effects" in the camera. (e.g. Use a VCR camera mounted on a tripod. Take a medium shot of two students walking toward each other. When the students are facing each other, each student raises his right hand to give a "high five" by slapping their hands together in the air. The very moment the hands begin to make contact press (or have another student press) the pause button/switch on the VCR or camera. NOTE: Do not move the camera at all!!! While the camera is still on pause, have the students leave the scene. When the students are completely out of the viewing range of the camera lens, and nothing in the set has changed, press the pause switch again (allowing the system to continue recording what the camera "sees." When played back it will appear that when the students slapped hands they disappeared.)
9. Demonstrate how to edit a scene by re-shooting over old "footage." Shoot a scene with the camera and VCR system. Stop the tape and rewind back to a given point. Prepare the scene over again and begin acting. When the point in the scene begins to match where the recorder was stopped or rewound to, then quickly push the pause button (to begin taping again), and continue taping through the scene. The students may have to have more than a few takes to get the timing set properly but they can manage with practice. NOTE: It may prove helpful to rewind the tape to a place where the camera angle or scene changes so that the re-taping will hardly be noticed if at all.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Record a demonstration of safety rules, measuring techniques, drafting techniques, etc., to be used as a teaching aid for classroom use.
2. Produce a News broadcast with reports, (local, state, and school), some weather, interviews and sports, to show during homeroom in the school.
3. Demonstrate and explain the characteristics and effects of audio energy as it collides with a surface. NOTE: The recorder must have a VU meter integrated into the recording system to identify any meter deflection or differences in audio reception. Set up the experiment on a test bed by pointing a bell, with a mailing tube around it, toward a receiver (microphone) on the other end of the test bed. Have reflector board set up at 90 degrees perpendicular to the test bed and halfway between the transmitter (bell) and receiver (microphone). Angle the bell and receiver toward the reflector board at 15, 30, 45, 60, 75, and 90 degrees, respectively (using a protractor on each end may prove helpful). Record the VU meter readings on each degree of reflection and chart these readings on a graph.
4. Record the effects of various surfaces upon the reflection and refraction of audio energy (e.g. aluminum foil, white paper, black paper), using the test bed mentioned in Advanced Activity #3.
5. Use a computer to plot the readings from the experiment in number 5, using a different colored line for each transmitter setting.
6. Experiment to find the most efficient reflector shapes.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

A VCR system including: camera, video recorder, TV/monitor, video tapes
Record Player
Taper Recorder
Mixer, Jacks, Microphones
CAD System

MATERIALS/CORE:

Chalk
Transparencies
Poster Board
Markers
Paper
Pencils
Batteries
Video Tapes, Records, and Cassette Tapes

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATION OF TERMS:

Network
Zoom
Medium Shot (MS)
Full Shot (FS)
Commercials
Newscaster
Public Stations
Actors
On Camera (OC)
Market Research
Camera Operators
Voice Over (VO)
Director
Stage Manager
Announcer
Stage Hands
Commercial Production
Count Down
VCR
Graph Paper
Current
Close-up (CU)
Affiliate
Storyboard
Disc Jockey
Angle Shot
Commercial Stations
Freeze Frame
Content Area
Actresses
Pan
Script
Tilt
Assistant Director
Cue Cards
Emcee
Set Design
Company
Fade-in (out)
Turntable
Tone Arm
Footage

REFERENCES:

Book, A. C. and Clary, N. D., The Radio and Television Commercial, Chicago, Ill.: Craing Books, 1978.

Communication Technology Curriculum Guide, Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Research and Development Section, 100 North First Street, Springfield, Illinois 62777, 1984.

Diamont, L. (ed), The Anatomy of a Television Commercial, New York: Hastings House, 1970.

Havenstein, A. D. and Bachmeyer, S. A., The World of Communications Visual Media, Bloomington, Il.: McKnight Publishing Co., 1974.

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

McMahan, H. W., How to Evaluate Your Own TV Commercial, East Greenwich, RI.: Weaver Publishing Co., 1973.

Ross, W. A., Best TV and Radio Commercials, New York: Hastings House Publishers, 1968.

REFERENCE: 5.13

MAJOR TITLE: Communication Technology

UNIT TITLE: Impact and Careers in Audio/Video Communications

MAJOR CONCEPT: Audio/Video production has had a major impact on career opportunities and effectiveness of communication.

TOPICS:

1. Impacts of Audio/Video Production
2. Careers in Audio/Video Production

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Discuss some of the effects that audio/video has had on our society.
2. Identify some careers in audio/video production.

CORE INSTRUCTIONAL ACTIVITIES:

1. List and discuss how audio/video production has affected us. (i.e.- allowing us to experience the sights and sounds of faraway places, learn about events almost immediately after they happen, present fictitious situations as if they were real, allow us insight into a variety of different customs, traditions, and styles, causing a decline in interpersonal relationships, changing our entertainment activities, greatly increasing the processing time of recording images (as soon as the camera stops it is ready for playback), information storage techniques such as a graphic communications firm keeping all of their records on video files, allowing quick access and computer enhancement techniques to be used.)
2. Use the *SOUTH CAROLINA OCCUPATIONAL INFORMATION SYSTEM (S.C.O.I.S.) to identify career opportunities in audio/video production.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Research a given career in audio/video production. Produce a video tape simulation type program where the student participates in actual role modeling as if he/she is an actual professional in the field of audio/video production. Demonstrate and/or report on the skills and/or knowledge used or needed for the particular career.
2. Make a chart that shows career opportunities in audio/video production, the educational or prerequisite requirements, and the yearly (or cost per job) salaries of each career listed.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

A VCR system including: camera, video recorder, TV/monitor
Record Player
Cassette Recorder
Recording mixer w/jacks
Tape Recorder
Microphones

MATERIALS/CORE:

Poster Board
Colored Markers, Pencils, Paper
Video Tapes, Records, and Cassette Tapes

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATION OF TERMS:

Network
Zoom
Medium Shot (MS)
Full Shot (FS)
Commercial
Newscaster
Public Stations
Actors
On Camera (OC)
Market Research
Camera Operators
Voice Over (VO)
Dolly
Fade-in
Director
Stage Manager
Announcer
Stage Hands
Commercial Production
Count Down
Turntable
Tone Arm
Pause
Auxiliary
Close-up (CU)
Affiliate
Storyboard
Disc Jockey
Angle Shot
Commercial Stations
Freeze Frame
Content Area
Actresses
Pan
Script
Tilt
Fade-out
Zoom-in/out
Assistant Director
Cue Cards
Emcee
Set Design
Company
VCR
Graph Paper
Current
Record

REFERENCES:

Communication Technology Curriculum Guide, Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Research and Development Section, 100 North First Street, Springfield, Illinois 62777, 1984.

Havenstein, A. D. and Bachmeyer, S. A., The World of Communications Visual Media, Bloomington, Ill.: McKnight Publishing Co., 1974.

Jones, Ronald E., and Robb, Janet L., Discovering Technology Communication, New York, N.Y.: Harcourt, Brace, Jovanovich Publishers, 1986.

*For more information on the SOUTH CAROLINA OCCUPATIONAL INFORMATION SERVICE (S.C.O.I.S.), contact your Principal or your local school District Office.

COMMUNICATIONS TECHNOLOGY SPECIALIZED TOOLS AND EQUIPMENT

1 DRAFTING AND DESIGN

2-CAD System: (Plotter, Mouse, Computer, CRT, 128K, RAM, Keyboard, 2 Disk Drives)
1-Drafting Machine

2.1 GRAPHIC COMMUNICATIONS

Computer: (CRT, CPU, Printer, Dual Disk Drive)
Rubber Stamp
Brayer
Screen Print Frame
Copier
Ink Pad
Squeegee
Stylus
Glass Plates
Duplicator
Line Gauges
X-Acto Knife Set
Scale
Hot type
Inking Pen
Transfer Letters
Proof Press
Cold Type
Platen Press
California Job Case
Heat Transfer Machine
Foundry Knife
Paring Knife
CNC Milling Machine
Iron
Thermal Fax Copier
Thermal Lamp
Offset Press
Process Camera
Light Table
Platemaker
Paper Cutter
Three Ring Hole Punch
Laminating Machine
Plastic Binding Machine
Hot Wax Machine
Phototypesetter

3 PHOTOGRAPHIC TECHNOLOGY

(2) 35mm Camera Kit (to include: 35mm SLR Automatic Camera, Aperture, Shutter with Manual Override, 50mm Lens, Lens Shade, Lens Case, and Camera Strap)
Filter Pack (to include: UV, Polarizing, Skylight, Red, Yellow Filters)
Dedicated Electronic Flash Complete with Module, Cords, Batteries and Charger (handle mount guide No. 80-100 with 100 ASA film)

Dichroic Enlarger Kit (to include: Dichroic Head, Filters, Power Supply, Stabilizer, Base, Chassis, Negative Carriers, Lens Board, and El Nikkor 50mm-75mm Lens)
Darkroom Kit (to include: GRA-LAB 300 Timer, 8X10 Adjustable Easel, 8X10 Developing Trays (4), Paper Safe, Safe Lights (2), Patterson System-4 Developing Tanks with Reels (3), Stainless Steel Thermometer, Print Washer, Chemical Storage Bottles, Drying Rack, Contact Printer, Bulk Film Loader)
Tripod
Darkroom Sink
Exhaust Fan with Light Trap
Paper Cutter
Changing Bag
Photo Flood Light with Stand (2)

4.1 ELECTRONICS TECHNOLOGY

A VCR System including: Camera, Video Recorder (with Portable Power Pack), TV/Monitor
Record Player
Tape Recorder (open reel)
Recording Mixer w/Jacks
Microphones
Computer System including: Two Disk Drives, 128K RAM, Keyboard, CPU, Monitor, and Printer/Plotter, Modem, Joystick, Mouse, Touch Tablet, Light Pen
Cassette Recorder
Telephone
CB Radio and/or Ham Radio
Communication Module including Radio and TV Assembly Kits/Circuits
Fiber Optics Module/Kit
Multimeter (used to measure volts, ohms, and amps)
Oscilloscope
Projector Screen
Pocket Mirror
Flashlight (Quartz Halogen)
"Lazy Susan"
Satellite Dish
Laser Kit/Package including: Laser, Mirrors, Microphone Accessories, Detector, Amplifier
Microscope
Stop Watch
CAM or CNC (Computer Numeric Control) to manufacture a given computer aided design

STANDARD TOOLS AND EQUIPMENT:

Overhead Projector
Overhead Markers
Scale (U.S. Customary-25)
Scale (Metric-25)
Chalkboard
Coping Saw (5)
Drill Press
Chalkboard Compass Set
Chalkboard Triangle Set
Complete Drafting Set (15)
Fire Extinguisher
Assorted Brushes
X-Acto Knife Set

UNITS FOR CONSTRUCTION TECHNOLOGY
RECOMMENDED INSTRUCTIONAL TIME

	9 WKS	18 WKS	36 WKS
1. Introduction to Construction Technology			
1.1 Products of Construction	1	1	1
1.2 Impacts of Construction	1	1	1
2. Establishing and Maintaining a Construction Enterprise			
2.1 Planning the Enterprise	1	2	5
2.2 Organizing the Enterprise	1	2	4
2.3 Controlling the Enterprise	1	2	4
3. Selecting and Purchasing a Site			
3.1 Surveying and mapping	1	2	5
3.2 Soil Testing	1	1	2
3.3 Securing a Site	1	2	4
4. Designing Construction Projects			
4.1 Idea Generation Through Sketching	1	2	4
4.2 Refining Design Solutions	1	2	4
4.3 Drafting Construction Plans	1	5	10
5. Engineering Construction Projects			
5.1 Engineering for Structural Integrity	1	2	5
5.2 Engineering Systems	1	4	8
6. Construction Production Technology			
6.1 Preparing for Construction	1	3	5
6.2 Setting Foundation	1	3	7
6.3 Building Superstructures	11	13	25
7. Installing Utilities			
7.1 Plumbing and Piping	1	2	5
7.2 Heating/Air Conditioning/Ventilation	1	3	5
7.3 Electrical	1	2	5
7.4 Communications	1	2	4
8. Inspecting Construction Projects			
8.1 Building Codes and Permits	1	2	3
8.2 Conducting Inspections and Approval	1	2	4
9. Enclosing Structures			
9.1 Roofing	1	5	10
9.2 Exterior walls	1	5	10
9.3 Insulating	1	3	6
9.4 Interior Walls, Floors, and Ceilings	1	5	10
10. Finishing Structures			
10.1 Painting, Decorating, and Installing Accessories	1	4	8

	9 WKS	18 WKS	36 WKS
11. Completing the Site			
11.1 Clean-up, Cutting Accesses, and Landscaping	2	2	4
12. Maintaining and Repairing Construction Projects			
12.1 Maintaining, Servicing, and Changing the Constructed Project	2	2	4
13. Exploring Construction Technology			
13.1 Future of Construction	3	4	8
Total Hours	45	90	180

REFERENCE: 1.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Products of Construction

MAJOR CONCEPT: There are many types of constructed products.

TOPICS:

1. Construction for living and working (offices, homes, churches).
2. Non-dwelling construction (dams, tunnels, highways, power transmission structures, monuments, factories, commercial buildings, and piping systems).

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe five types of building construction products (houses, public service buildings, commercial buildings, high-rise buildings, and factories).
2. Describe six types of non-dwelling construction products (roadways, water control projects, piping systems, industrial complexes, electric power systems, and communications systems).

CORE INSTRUCTIONAL ACTIVITIES:

1. Divide the class into teams. Each team will make a chart which lists and describes five types of building construction products and six types of non-dwelling construction products.
2. In teams, produce a bulletin board using magazine pictures and words to describe five types of building construction products and six types of non-dwelling construction products.
3. Divide the class into teams for a contest. Build a house of playing cards. Largest in 20 minutes is the winning house. Compare this with adobe, sod construction, and concrete block/mortar construction.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Build models of types of structures.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

Magazines
Markers
Yard Stick (1per team)
Stapler/staples
Scissors (1per student)
Cardboard base
Glue
Poster Paper (1per team)
Playing cards or 3x5 index cards (1 deck per team)
Construction Paper (to cover the bulletin board)

TOOLS AND EQUIPMENT/ADVANCED:

- Hammers
- Crosscut Saws
- Safety Glasses

MATERIALS/ADVANCED:

- Wood Strips
- Pebbles
- Brads
- Paper
- Straws
- Acetate Sheets
- Glue
- Scissors
- Yard Sticks

APPLICATION OF TERMS:

- Structure
- House
- Public Service Buildings (schools, courthouses, hospitals)
- Commercial Buildings (office buildings, supermarkets, shopping centers, banks)
- Industrial Buildings (warehouses, factories)
- High-rise Buildings (offices, apartments, hotels)
- Roadways (railroads, highways, service roads, airport runways, bridges, tunnels)
- Water Control Projects (jettes, breakwater, dams)
- Pipelines (sewer, natural gas, oil, water)
- Industrial Complexes (steel mills, paper mills, oil refineries, shipyards, electrical power stations, electrical communication systems)

REFERENCES:

Geotsch, David T., and Nelson, John A., Technology and You, Albany, N.Y.: Delmar Publishers, Inc., 1987.

Henak, Richard M., Exploring Construction, South Holland, Ill.: Goodheart-Willcox Company, Inc., 1985.

REFERENCE: 1.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Impacts of Construction

MAJOR CONCEPT: Construction technology has had a great effect on your life.

TOPICS:

1. Allows you to live anywhere, travel, buy products that are transported, and communicate long distances.
2. Helps countries develop and communities grow.
3. Provides many jobs/careers.

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List and discuss at least four ways construction has affected his/her life (e.g. shelter, communication systems, transportation systems, and utility systems).
2. Explain and give examples of ways construction affects the development of nations and communities (Examples: The Erie Canal and railroads helped pioneers move west. Dams control floods, provide power sources, aid agriculture, and provide recreational facilities. Roadways are necessary for industrial development).
3. List and describe ten careers in construction.

CORE INSTRUCTIONAL ACTIVITIES:

1. Design, produce, and test two heating methods (fire and piped-in hot water). Tests will be conducted using three thermometers spaced at various distances in a metal container. Discuss the results of tests in terms of home construction requirements.
2. Compare and contrast life in a developed area (having high level construction technology) with life in an undeveloped area (lacking high level construction technology).
3. List examples of constructed products (roads, hospitals, recreational facilities, etc.) which meet the needs of people in your community. Discuss which needs the structures meet and how construction has changed your community in the past few years.
4. List and discuss jobs generated through the construction of your school building.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Report on a construction project which has helped a community or nation develop. Include positive and negative impacts.
2. Research and make a model of a structure utilizing an historically significant structural method. Using a time line, plot where this method fits historically among other structural methods.
3. Design and produce a primitive structure (tepee or beam bridge) and a more advanced structure (log cabin or truss bridge). Test, analyze, and compare the structural integrity of each (rain, wind, etc.).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Hack Saw
Safety Glasses

MATERIALS/CORE:

Dictionary of Occupational Titles
Encyclopedias
Kindling
3 Thermometers
PVC Pipe and Joints
Hot Water Source
Metal Container
Matches
PVC Cement
Tubing

TOOLS AND EQUIPMENT/ADVANCED:

Back Saws
Safety Glasses

MATERIALS/ADVANCED:

Encyclopedias
Glue
Heavy Paper
Wood Strips
Dowels
Fan
Spray Bottle, etc. depending on structures selected for Activity 3

APPLICATION OF TERMS:

Architect
Drafting Technician
Carpenter
Electrician
Real Estate Agent
Contractor
Retail Representative
Structural Steel Worker
Regional Planner
Glazier
Elevator Constructor
Heavy Equipment Operator
Plaster and Cement Finisher
Roofer
Surveyor
Foreman
Cabinet Maker
Telephone Installer
Engineer
Carpenter
Mason
Plumber
Heating and Cooling Mechanic
Wholesale Representative
Subcontractor
City Planner
Landscaper
Insulation Worker
Painter
Laborer
Sheetmetal Worker
Apprentice
Manager
Interior Decorator
Inspector
Welder

REFERENCES:

Betts, M. Roger, et.al., Exploring the Construction Industry, Bloomington, Ill: McKnight Publishing Co., 1976.

REFERENCE: 2.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Planning the Enterprise

MAJOR CONCEPT: Construction planning involves deciding what is to be done, where it is to be done, when it will be done, and how it will be done.

TOPICS:

1. Formulating Goals
2. Researching the Proposed Project Requirements
3. Designing the Project
4. Engineering the Project

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Discuss the four parts of the planning phase (formulating, researching, designing, and engineering) of construction projects.
2. Implement these four phases in planning a construction project.

CORE INSTRUCTIONAL ACTIVITIES:

1. Formulate goals for a (model) pipeline project by asking such questions as: Do people need this construction project? Should the project be built? Can the project be built? Will the project add value to the community? Will it make money for the builder? Will it meet the needs of the owner? What must be its capacity?
2. Research information that will help make decisions about the construction project by: testing the hardness of the soil from a mock site to determine the kind of foundation needed, testing the strength of various support designs to see what load (weight) they can support, and locating utility lines on the mock site.
3. Design the construction of the project after the questions in #1 and #2 have been answered by determining what purpose the structure will serve. Sketch several design solutions. Make a paper mockup of the best solution.
4. Engineer the structure and choose the materials to build it. Make refined sketches and a cost sheet. Identify and schedule the tasks which will be performed throughout the construction project.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Formulate goals for a model truss bridge project by asking such questions as: Do people need this construction project? Should the project be built? Can the project be built? Will the project add value to the community? Will it make money for the builder? Will it meet the needs of the owner? What must be its capacity?
2. Research information that will help make decisions about the construction project by testing the hardness of the soil of a mock site to determine the kind of foundation needed, testing the strength of various truss designs to see what load (weight) they can support, and locating utility lines on the mock site.

3. Design the construction of the bridge project after answering the questions in #1 and #2. Sketch several design solutions.
4. Engineer the structure and choose the materials to build it. Prepare refined sketches, and identify and schedule the tasks which will be performed throughout the construction project.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Hydraulic Trainer (adapted for load & soil testing)
Standard Equipment

MATERIALS/CORE:

Mock Site
Wood Strips
Concrete Block Scrap
Metal Scrap
Pebbles
Tape
Vise
Plastic Tubing/Fittings
Wood Scrap
Silicon Sealant
Glue
Paper
Rulers

TOOLS AND EQUIPMENT/ADVANCED:

Standard Tools & Equipment

MATERIALS/ADVANCED:

Mock Site
Wood Strips
Metal Scrap
Pebbles
Tape
Wood Scrap
Concrete Block Scrap
Glue
Paper

APPLICATION OF TERMS:

Research
Formulate
Architect
Contractor
Project
Goals
Criteria
Data
Contrast
Forecasting
Retrieving
Function
Performance
Model
Scale Model
Standard
Scheduling
Girder Bridge
Development
Design
Engineer
Initiate
Objectives
Consultant
Evaluate
Compare
Rate
Programming
Describing
Postulating
Specification
Solution-in-Principle
Prototype
Estimate
Experimenting
Cantilever Bridge

Arch Bridge
Vertical Truss
Warren Truss
Pratt Truss

Suspension Bridge
Diagonal Truss
Subdivided Warren
K-Truss

REFERENCES:

Betts, M. Roger, et.al. Exploring the Construction Industry, Bloomington, Ill.: McKnight Publishing Co., 1976.

Lux, Donald G., et.al., World of Construction, Encino, Ca.: Glencoe Publishing Co., 1982.

REFERENCE: 2.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Organizing the Enterprise

MAJOR CONCEPT: The organizing phase of construction involves gathering the people, tools and equipment, resources, knowledge, and finances needed to begin a project.

TOPICS:

1. Structuring (arranging the stages of) a construction enterprise
2. Supplying (obtaining equipment, supplies, and workers for) a construction enterprise

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify work to be done and the people and materials needed to do it.
2. List and describe six necessary inputs for a construction project (finances, knowledge, resources, tools and equipment, energy, and personnel).
3. Order supplies and schedule equipment for a construction project.
4. Discuss five personnel practices (hiring, training, working, advancing, and retiring).

CORE INSTRUCTIONAL ACTIVITIES:

1. Plan the work to be done in constructing a model pipeline to carry oil across a mock site on a river, and identify the personnel and materials needed.
2. Identify and estimate the amounts of inputs (money, knowledge, resources, tools and equipment, energy, time, and personnel) necessary to build the project.
3. Order supplies and schedule equipment to build the pipeline.
4. Use the classified section of the newspaper to locate three construction job openings.
5. Fill out a job application form.
6. Set up criteria for hiring.
7. Role play a job interview.
8. Participate in an on-the-job training program for a class project (pipeline construction).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Plan the work to be done in constructing a model bridge to bear a load (identified by the instructor) across a mock site having a river, and identify the personnel and materials needed.
2. Identify and estimate the amounts of inputs (money, knowledge, resources, tools and equipment, energy, time, and personnel) necessary to build the project.
3. Order supplies and schedule equipment to build the bridge.
4. Research hiring criteria and employer/employee expectations.
5. Design an on-the-job training program for a class project (bridge construction).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

Classified Sections of Newspapers
Job Application Forms

TOOLS AND EQUIPMENT/ADVANCED:

None

MATERIALS/ADVANCED:

None

APPLICATION OF TERMS:

Organizing
Equipment
Tools
General Contractor
Supplier
Structuring
Supplies
Machines
Subcontractor

REFERENCE:

Lux, Donald G., et.al., World of Construction, Encino, Ca.: Glenco Publishing Co., 1982.

REFERENCE: 2.3

MAJOR TITLE: Construction Technology

UNIT TITLE: Controlling the Enterprise

MAJOR CONCEPT: In the controlling phase, management directs, monitors, reports, and corrects the progress of the project.

TOPICS:

1. Directing
2. Monitoring
3. Reporting
4. Correcting

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List and discuss the applications of the four elements of the controlling phase of construction (directing, monitoring, reporting, and correcting).
2. Discuss what would happen to a construction project if it was not controlled.

CORE INSTRUCTIONAL ACTIVITIES:

1. Direct workers (tell them what, when, and how to do the work) on the pipeline construction project.
2. Monitor the work (keep the work on schedule and check work quality) on the pipeline construction project.
3. Report (feedback) information gathered during the monitoring phase about problems occurring during construction of the pipeline, so corrections can be made.
4. Correct (take action to solve) the reported problems to save money and time on the pipeline construction project.
5. Construct the model pipeline, then discuss where more controls would have made the project better.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Direct workers (tell them what, when, and how to do the work) on the bridge construction project.
2. Monitor the work (keep the work on schedule and check work quality) on the bridge construction project.
3. Report (feedback) information gathered during the monitoring phase about problems occurring during construction of the bridge, so corrections can be made.
4. Correct (take action to solve) the reported problems to save money and time on the bridge construction project.
5. Construct the model bridge, then discuss where more controls would have made the project better.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Standard Tools and Equipment

MATERIALS/CORE:
Depends on the availability of materials. Use whatever you can find that is appropriate.

TOOLS AND EQUIPMENT/ADVANCED:
Standard Tools and Equipment

MATERIALS/ADVANCED:
Same as Core

APPLICATION OF TERMS:

- Management
- Job Supervisor
- Building Inspector
- Time Clock
- Building Codes
- Inspection
- Reporting
- Testing
- Foreman
- Monitor
- Inventory Control
- Superintendent
- Timekeeper
- Directing
- Controlling

REFERENCE:
Betts, M. Roger, Exploring the Construction Industry, Bloomington, Ill.: McKnight Publishing Co., 1976.

REFERENCE: 3.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Surveying and Mapping

MAJOR CONCEPT: All construction is located on a site with features that must be surveyed or measured and then put on a map.

TOPICS:

1. Land Area Surveys
2. Topographic Surveys
3. Route Surveys
4. Hydrographic Surveys
5. Area Surveys
6. Construction Surveys
7. Locating Artificial Features on a Site

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Set up and use a transit to determine a given land area through triangulation.
2. Name six types of surveys.
3. Describe a survey party by listing members and their duties.
4. Identify the steps used in a survey sequence.
5. Calculate the acreage in a parcel of land.
6. Identify property boundaries using three methods (lot pins, meters and bounds, meridians, and base lines).

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify land to be surveyed.
2. Set up a transit and take readings to establish corners and other reference points on the land (laboratory may be used).
3. Discuss the six types of surveys and the job duties of survey workers.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Survey a plot as a survey party using a laser and traditional methods to set corner pins.
2. Draw a survey plot and write a legal description for the area. (Use this formula to calculate the acreages for square or rectangular areas: acres equals length in feet times width in feet, divided by 90,245 square feet. Use this formula to calculate the acreages for triangular areas: acres equals length of base in feet times height in feet, divided by 90,245 square feet.)
3. Make a contour map.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Level Rod
- Calculator
- Hammer
- Transit
- Stadia Rod
- Chain
- Stakes
- Surveyor's Tape
- Level Bar
- Level Bar Pin

MATERIALS/CORE:

- None

TOOLS AND EQUIPMENT/ADVANCED:

- Optical Surveying Apparatus
- Laser Surveying Apparatus
- Drafting Tools

MATERIALS/ADVANCED:

- Field Notebook
- Grid Paper

APPLICATION OF TERMS:

- Aerial Surveys
- Bench Marks
- Chain
- Consultants
- Elevation
- Grid System
- Hydrographic Surveys
- Land Surveys
- Meridians
- Parallels
- Profiles
- Rectangular
- Route Surveys
- Survey Parties
- Topographic Map
- Triangulation
- Base Lines
- Chief
- Construction Surveys
- Contours
- Field Notebook
- Horizontal Control
- Instrument Assistant
- Laser Beam
- Monuments
- Plotting
- Recorder
- Resurveys
- Surveyor Helper
- Theodolite
- Transit
- Vertical Control

REFERENCES:

Brown, C. Brown, Drafting for Industry, South Holland, Ill.: The Goodheart-Willcox Co., Inc., 1984.

Lux, Donald G., World of Construction, Bloomington, Ill.: Mcknight Publishing Co., 1982.

REFERENCE: 3.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Soil Testing

MAJOR CONCEPT: Soil must be tested to determine the type of foundation needed.

TOPICS:

1. Reasons for Soil Testing
2. Soil Characteristics
3. Soil Analysis
4. Testing Methods

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Test soil for quality of bearing surface.
2. Experiment with soils for erosion resistance.

CORE INSTRUCTIONAL ACTIVITIES:

1. Using measuring devices, containers, and soil samples:
   a) analyze two soil samples (clay and sandy soil) to find out if excavation facing is needed.
   b) test two soils (clay and sand) for water absorption.
   c) analyze the soil compaction of clay and sandy soils.
2. Perform tests to prove when soil is removed from its original position it becomes less stable. (Stream of water on excavated and unexcavated soil)
3. Discuss how foundation design is influenced by soil characteristics.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Conduct the following field tests:

a) soil stability (plate bearing test)
b) settlement (plate bearing test)
c) impacting (density test)
d) depth of bedrock (geophysical test)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Soil Tester
Split Barrel Soil Sample
Liquid-limit Device

MATERIALS/CORE:

Brick
Clay
Paper Towels
Sand
Paper Cups
Various Types of Soil

TOOLS AND EQUIPMENT/ADVANCED:

- Soil Resistivity Meter
- Laboratory Soil Compactor
- Liquid-limit Testing Device

MATERIALS/ADVANCED:

- Soil of Various Types
- Paper Cups

APPLICATION OF TERMS:

- Bed Rock
- Characteristics
- Cobbles
- Compressible
- Density Test
- Gravel
- Pilings
- Plasticity
- Samples
- Settlements
- Silt
- Soil Analysis
- Soil Testing
- Test Pits
- Water Table
- Boulder
- Clay
- Cohesive
- Cores
- Geophysical Test
- Heaving
- Load-bearing Surface
- Plate-bearing Tests
- Sand
- Shoring
- Shakes
- Soil Stability
- Surface Water
- Voids
- Erosion

REFERENCE:

Ray, Willis E., World of Construction, Bloomington, Ill.: McKnight Publishing Co., 1982.

REFERENCE: 3.3

MAJOR TITLE: Construction Technology

UNIT TITLE: Securing a Site

MAJOR CONCEPT: The site must meet the needs of the client, and the project must be acceptable to the community.

TOPICS:

1. Acquiring Real Estate
2. Zoning
3. Estimating and Bidding

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Select a site for construction using a city/county map.
2. Determine if zoning laws permit building a given type of structure on the site (single family dwelling, commercial enterprise, etc.).
3. Determine ownership and availability of the site.
4. Estimate costs and prepare a bid.

CORE INSTRUCTIONAL ACTIVITIES:

1. Determine zoning restrictions, current ownership, site availability, utility availability, access, and practicality of building a single-family dwelling on a given site.
2. Estimate and prepare a bid based on the costs of the site, utilities, building permits, labor, and building schedule.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Propose solutions to a land use problem in the community (access, dwelling, heavy industry).
2. Determine the needs (place, utilities, access, aesthethics, surrounding structures, space for structure and parking, available transportation systems, soil characteristics) for an industrial structure.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

City/County Map
Title Records
Building Schedule
Blueprint of Dwelling
Zoning Codes
Utility Diagram
Pay Schedules

MATERIALS/CORE:

City/County Map
Title Records
Building Schedule
Blueprint of Dwelling
Zoning Codes
Utility Diagram
Pay Schedules

TOOLS AND EQUIPMENT/ADVANCED:

- Environmental Impact Statement
- Blueprint of Industrial Facility
- Site Contour Map

MATERIALS/ADVANCED:

- Environmental Impact Statement
- Blueprint of Industrial Facility
- Site Contour Map

APPLICATION OF TERMS:

- Site
- Area
- Estimate
- Clear Title
- Utilities
- Proposal
- Competitive Bid
- Aesthetics
- Zoning Restrictions
- Real Estate
- Utilities
- Bid
- Building Schedule
- Drainage
- Access
- Pay Schedule
- Environmental Impact
- Transportation
- Title Search

REFERENCE:

Henak, Richard M., Exploring Construction, South Holland, Ill.: The Goodheart-Willcox Co., 1985.

REFERENCE: 4.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Idea Generation Through Sketching

MAJOR CONCEPT: Sketches allow designers to quickly explore many design possibilities.

TOPICS:
1. Developing Ideas Through Sketching
2. Refining Ideas
3. Identifying Problems
4. Selecting the Best Design
5. Sketching a Working Drawing

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Make sketches of a proposed project (supplied by teacher).
2. List and give the function of the materials needed to complete a project.

CORE INSTRUCTIONAL ACTIVITIES:

Sketch a single family dwelling or other structures.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Make a rough design using a Computer Aided Drafting (CAD) system to design a sports facility.
2. Make a rough design using a Computer Aided Drafting (CAD) system to design a public park.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

Grid Paper

TOOLS AND EQUIPMENT/ADVANCED:

Computer Aided Drafting (CAD) System

MATERIALS/ADVANCED:

Computer Paper

APPLICATION OF TERMS:

- Functional
- Specification
- Dimension
- Working Drawing
- Elevation Drawing
- Mechanical Drawing
- Client
- Refine
- Analyze
- Section Drawing
- Civil Drawing
- Architectural Drawing

REFERENCES:

Fannin, John W., Exploring the Construction Industry, Bloomington, Illinois: McKnight Publishing Company, 1976.

Henak, Richard M., Exploring Construction, South Holland, Ill.: The Goodheart-Wilcox Co., 1985.

REFERENCE: 4.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Refining Design Solutions

MAJOR CONCEPT: Refining a design is changing an existing design to better meet the needs of the construction project.

TOPICS:

1. Determining Design Change Needs
2. Developing Solutions and Alternate Solutions
3. Choosing the Best Solution

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Revise a given design of a construction project that is being planned for construction in the laboratory.
2. Discuss six steps in the design process (identify, develop, refine, analyze, select, and implement).

CORE INSTRUCTIONAL ACTIVITIES:

1. Refine the sketch of a single family unit made in prior unit.
2. Given a rough sketch of a dwelling construction project, analyze the problems, offer alternate solutions, and sketch a polished design solution.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Use a Computer Aided Drafting (CAD) system to design the recreational facility for that completed in prior unit.
2. Given a rough sketch of a large construction project, analyze the problems, offer alternate solutions, and use a Computer Aided Drafting (CAD) system to produce a polished design solution.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Standard Drafting Tools and Equipment
Rough Sketch of Dwelling

MATERIALS/CORE:

Drafting Paper
Sketch Pad
Drafting Tape

TOOLS AND EQUIPMENT/ADVANCED:

Computer Aided Drafting (CAD) system
Rough Sketch of a Large Construction Project

MATERIALS/ADVANCED:

Printer Paper

APPLICATION OF TERMS:

Analyze
Architect
Client
Designing
Engineer
Implement
Material
Needs
Working Drawing
Drawing to Scale
Computer Aided Drafting (CAD)
Appearance
Brainstorming
Cost
Design Process
Function
Limitation
Model
Specifications
Dimensions
Scale

REFERENCES:

Blankerbaker, E. Keith, World of Construction, Bloomington, Ill.: McKnight Publishing Co., 1982.

Henak, Richard, Exploring Construction, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1985.

REFERENCE: 4.3

MAJOR TITLE: Construction Technology

UNIT TITLE: Drafting Construction Plans

MAJOR CONCEPT: Working drawings describe the physical details of a project such as size, shape, and placement on the land.

TOPICS:

1. Scale Drawings
2. Site Plan Drawings
3. Foundation Plan Drawings
4. Floor Plan Drawings
5. Elevation Drawings
6. Section and Detail Drawings
7. Reproduction of Drawings

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Interpret a scale drawing.
2. Name and define two types of drawings (working and shop).
3. Prepare working drawings from a sketch.
4. Reproduce drawings on a blueprint machine.

CORE INSTRUCTIONAL ACTIVITIES:

1. Read and discuss a given set of working drawings.
2. Sketch a site plan, floor plan, and/or elevation on grid paper.
3. Make a cardboard floor plan from project plans.
4. Reproduce drawings on a blueprint machine.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Prepare a set of working drawings to include foundation, floor, elevations, and detailed drawings using drafting tools or a Computer Aided Drafting (CAD) system.
2. Prepare a set of rendered display drawings of a constructed product.
3. Design a display model of a modern office building.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Drafting Equipment
Blueprint Reproduction Machine

MATERIALS/CORE:

Blueprint Paper
1/4" Grid Paper
Various Materials (paper, glass, plastic, chalk, etc.) for models

TOOLS AND EQUIPMENT/ADVANCED:

Drafting Equipment
Computer Aided Drafting (CAD) System

MATERIALS/ADVANCED:

Various materials (paper, plastic, paints, chalk) for renderings
Computer printing paper

APPLICATION OF TERMS:

- Architectural Drawing
- Shop Drawings
- Foundation Plan
- Elevations
- Blueprint
- Site Plan
- Engineering Drawing
- Working Drawings
- Floor Plan
- Computer Aided Drafting (CAD) System

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, Illinois: The Goodheart-Willcox Company, Inc., 1985.

REFERENCE: 5.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Engineering for Structural Integrity

MAJOR CONCEPT: Structures must be engineered to handle stresses.

TOPICS:

1. Material Analysis
2. Determination of Structural Requirements
3. Safety Factors

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define structural integrity.
2. List the three areas in which a structure endures stress: (Innate Weight, Outside Forces, and Usage Forces).
3. Define and discuss "safety factor".
4. Explain why a careful material analysis is necessary before attempting to engineer for structural integrity.
5. Compare different materials in terms of strength characteristics.

CORE INSTRUCTIONAL ACTIVITIES:

1. Use a paper straw, plastic straw, and copper tubing to illustrate the different points at which each loses its structural integrity. Test each for tensile, compression, and flexure strength using a spring or kitchen scale, and attachments.
2. Use thin (less than 1 inch) strips of wood, plastic, etc., to illustrate collapse under innate weight. Support the strips at points farther and farther apart until the strip folds under its own weight, or with a standard applied weight.
3. In the above activity, drop a weight on the midpoint of the strip to illustrate how outside forces and inertia affect structural integrity.
4. By asking "What if", students can soon convince themselves of the need for a safety factor. Recount for the students the balcony collapse in the hotel in Kansas City, MO. Discuss what should have been done to prevent this disaster.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Set up a bridge contest where the bridge may be made of any school supplies, and the winner will be determined by dividing the weight the bridge will support by the weight of the bridge, over a standard span.
2. Test woods, metals, plastics, ceramics, and concrete for the best ratio of flexure strength to material weight.
3. Create a miniature reinforced concrete beam using 1/8 inch reinforcement bar imbedded in a 1 inch square of concrete 10 inches long. Compare the flexure strength of the reinforced beam to that of a nonreinforced beam of equal dimensions.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Supports (sawbucks)
Spring or Kitchen Scale

MATERIALS/CORE:

Copper Tubing
Wood Strips
Plastic Strips
Plastic & Paper Straws
Metal Strips
Ceramic Strips

TOOLS AND EQUIPMENT/ADVANCED:

Forms for Pouring Concrete

MATERIALS/ADVANCED:

Same as for the Core Activities plus Concrete Strips and Reinforcement Bar

APPLICATION OF TERMS:

Structure
Integrity
Stress
Function
Analysis
Tensile
Compression
Environmental Forces
Load
Resistance
Safety Factor
Engineered
Flexure

REFERENCES:

Henak, Richard M., *Exploring Construction*, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1985.

Landers, Jack, *Construction: Materials, Methods, Careers*, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1983.

Lux, Donald G., Ray, Willis E., Blankenbaker, E. Keith, and Umstattd, William, *The World of Construction*, Encino, CA: Glencoe Publishing Company, 1982.

REFERENCE: 5.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Engineering Systems

MAJOR CONCEPT: The systems utilized in a structure allow for operating effectiveness, efficiency, and comfort.

TOPICS:

1. Electrical Power Systems
2. Sanitation/Plumbing Systems
3. Climate Control Systems
4. Communications Systems
5. Transportation Systems
6. System Criteria

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Differentiate between the Electrical, Sanitation/Plumbing, Climate Control, Communications, and Transportation systems.
2. Identify the function of each type of system.
3. Discuss the systems in construction projects.
4. Design, construct, and test one system used in construction.

CORE INSTRUCTIONAL ACTIVITIES:

1. Using 1/2" PVC pipe, fittings, and the lab spigot make a simple water system and test it for system integrity.
2. Participate in a classroom discussion to apply the above activity in achieving an understanding of how the system approach works no matter what material one is working with.
3. Construct an electrical circuit using 16/3 cable, a 10 amp. fuse and socket, an outlet and box, and a grounded plug. Plug in a hair dryer, and then a "room" electric heater to illustrate "load" and "overload". This activity can be repeated using different sizes of cable and fuses to establish the requirements of the system.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Research the difference between non-automated systems and automated systems. Discuss the findings with the class. (see system types in topics)
2. Construct a climate control system having automatic controls.
3. Design and install a plumbing system in a mock site. (A structure may not be necessary)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Hacksaw or Tubing Cutter
- 10" Pipewrench (2)
- Linesman Pliers (cutters)
- Heater
- Safety Glasses
- 5000 B.T.U. Air Conditioner (or smaller)
- Soldering Gun
- Wire Strippers
- 3/16" Flat Tip Screwdriver
- Plumbers Pressure Gauge

MATERIALS/CORE:

- 1/2" PVC Pipe
- 1/2" PVC Fittings
- Water Supply
- PVC Solvent
- Grounded Outlet
- 3/16" Cable
- Wood Screws
- Solder
- Grounded Plug
- Fuse Socket
- 10 Amp. Fuse
- Outlet Box
- Power Supply (outlet)
- Piece of 1/2" Plywood
- PVC Cement
- Solder Paste

TOOLS AND EQUIPMENT/ADVANCED:

- Drill Press
- Hole Saw
- Hacksaw
- Band Saw
- Twist Drill Bit
- Safety Glasses

MATERIALS/ADVANCED:

- Mock Site
- 1/2" PVC Pipe
- Plumbing Fixtures
- Materials for Climate Control System According to System Design
- PVC Cement
- 1/2" PVC Fittings

APPLICATION OF TERMS:

- System
- Thermostat
- Criteria
- Rheostat
- Load
- Ohms
- Amps
- Watts/Volts
- Breaker
- C.F.M. (air flow)
- Fuse
- Weight Limit
- Outlet
- Lubrication
- Cool
- Plumber's Pressure Gauge
- Overload
- Efficiency
- P.S.I.
- Effectiveness
- Solvent
- Operating Sequence
- Slope
- Climate
- Integrity
- B.T.U.
- Resistance
- Heat
- Service Box

REFERENCES:

Landers, Jack, Construction: Materials, Methods, Careers, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1983.

Lux, Donald G., Ray, Willis E., Blankenbaker, E. Keith, and Umstattd, William, The World of Construction, Encino, CA: Glencoe Publishing Company, 1982.

REFERENCE: 6.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Preparing for Construction

MAJOR CONCEPT: The construction site must be prepared before a structure can be built.

TOPICS:

1. Clearing the Site
2. Locating the Proposed Structure
3. Excavating
4. Providing Temporary Utilities

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify obstacles which need to be removed from the construction site (stumps, boulders, garbage, etc.).
2. Survey the site, locating and marking the area to be excavated.
3. Excavate the site using model trucks, earth movers, etc.
4. Identify the means for providing temporary utilities on the site.

CORE INSTRUCTIONAL ACTIVITIES:

1. Remove obstacles from a mock site.
2. Using a laser or transit survey the site. Locate and mark the area to be excavated.
3. Excavate the mock site.
4. Provide temporary utilities for the mock site.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. On the school grounds, use a transit, compass, and tape measure to locate a proposed structure according to the survey map furnished by the teacher.
2. Identify what would have to be done to prepare the site for construction.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Laser or Transit

MATERIALS/CORE:

Mock Site
Power Supply

TOOLS AND EQUIPMENT/ADVANCED:

Transit	Compass
Line Level	Tape Measure
Survey Map	String

MATERIALS/ADVANCED:

None

APPLICATION OF TERMS:

Utilities
Demolishing
Contouring
Salvaging
Degrees
Disposing
Batter Board
Clearing
Earthmoving
Level
Excavating
Structure Locating
Cutting
Soil Bearing Capacity

REFERENCES:

Henak, Richard M., *Exploring Construction*, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1985.

Landers, Jack, *Construction: Materials, Methods, Careers*, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1983.

REFERENCE: 6.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Setting Foundations

MAJOR CONCEPT: Structures must have a solid foundation.

TOPICS:

1. Bearing Surface
2. Footing
3. Substructures
4. Water Proofing and Damp Proofing

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Name the three elements of a foundation. (bearing surface, footing, substructure)
2. Identify and provide an application for three types of footings. (spread, slab, pile)
3. Discuss the steps of constructing a foundation for a dwelling and other structures.
4. Demonstrate one process of water and damp proofing.
5. Design and pour at least one footing.

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify the elements of a foundation and the types of footings from a blueprint or other reference. Discuss potential applications of each type.
2. Seal all but one face of a cinder block with asphalting sealer. Place tissue paper beneath block, and drip water on unprotected face. Compare effect on tissue paper with the same procedure using an unsealed block.
3. Construct a scale model foundation on a mock site.
4. Experiment using different coatings on concrete blocks and document the degree of success of each coating in water proofing foundation walls.
5. Design a footing for a dwelling. Build forms, mix and pour concrete, and screed the surface. (NOTE: by pouring 1 1/2 in. thickness and by placing masonite dividers at suitable intervals, the footing can be broken into squares for patio or walkway use).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Discuss and name two reasons why a built up aggregate is the only logical substructure for a highway. (drainage and expense)
2. Design, then excavate and pour miniaturized footings. (spread, slab, pile)
3. Perform a concrete slump test.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Cement Container
- 1/16" Drill Bits
- Concrete Hoe
- Spatulas
- Trowels
- Buckets

MATERIALS/CORE:

- Blue Prints
- Asphaltum Sealer
- Cement Sealer
- Cement
- Cinder Blocks
- Asphaltum
- Varnish
- Polyurethane
- Paint Brushes
- Gravel
- Mock Site
- Paint Brush
- Forming Wood
- Silicone
- Paint
- Sand
- Wax Cups

TOOLS AND EQUIPMENT/ADVANCED:

- Site Boxes
- Trowels
- Wood for Footings
- Cement Container
- Small Shovels
- Buckets
- Concrete Hoe

MATERIALS/ADVANCED:

- Masonite Sheets
- Form Wood
- Gravel
- Concrete

APPLICATION OF TERMS:

- Vibrating
- Screeding
- Bleed Water
- Slump
- Segregation
- Substructure
- Spread
- Raft
- Wall
- Pier
- Damp Proofing
- Aggregate
- Mason's Line
- Form
- Setting
- Edging
- Control Joint
- Troweling
- Parging
- Honey Combing
- Darbying
- Float
- Consistency
- Bearing Surface
- Footing
- Pile
- Foundation
- Column
- Water Proofing
- Built Up
- Mortar
- Course
- Curing
- Hydration
- Exposed Aggregate
- Grooving
- Placing

REFERENCES:

Betts, Roger M. et.al., Exploring the Construction Industry, Bloomington, Illinois: McKnight and McKnight Publishing Company, 1976.

Henak, Richard M., Exploring Construction, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1985.

Landers, Jack, Construction: Materials, Methods, Careers, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1983.

Reams, Jake, (1987), Cite (co-w-015), (co-w-016), (co-w-017), Ball State University, Muncie, In. 47306.

NOTES

REFERENCE: 6.3

MAJOR TITLE: Construction Technology

UNIT TITLE: Building Superstructures

MAJOR CONCEPT: A superstructure is above grade construction.

TOPICS:

1. Mass Structures
2. Bearing Wall Structures
3. Framed Structures

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify and describe three kinds of superstructures (mass, bearing wall, framed).
2. Demonstrate the application of three kinds of superstructures.

CORE INSTRUCTIONAL ACTIVITIES:

1. Build a mass structure (dam) on a mock site.
2. Build a miniature tilt-up bearing wall.
3. Build a miniature wood framed wall section, floor section, and ceiling section.
4. Identify the construction techniques used to build the superstructure of the industrial technology facility.
5. Identify various types of superstructures in your community.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Erect two steel column beams. Connect with an I-beam and appropriate flanges and bolts (first time holes must be drilled and reamed with proper alignment).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Standard Carpentry Tools

MATERIALS/CORE:

Cement
Gravel
Mesh Wire
Brads
Mock Site
Steel Rods (reinforcement concrete)
Glue

TOOLS AND EQUIPMENT/ADVANCED:

Drill
Ream
Carbide Tipped Bits

MATERIALS/ADVANCED:

- 2 Steel Columns
- Flanges
- Pins
- I-Beam
- Bolts, Nuts, Washers

APPLICATION OF TERMS:

- Girder
- Subfloor
- Sill
- Corner
- Sill Plate
- Fire Block
- Sill Shield
- Ceiling Joist
- Bridging
- Sheathing
- Rafter
- Gable Studs
- Collar Beam
- Roof Decking
- Angle Iron
- Riveting
- I-Beam
- Iron Worker
- Mason
- Tensile
- Flexure
- Chairs
- Asphalt
- Arches
- Cast
- Bearing Wall
- Tilt-up Bearing Wall
- Header
- Sole Plate
- Stud
- Top Plate
- Let-in Brace
- Girder Pocket
- Floor Joist
- Plank
- Tongue and Groove
- Rafter Plate
- Hip Rafter
- Ridge Board
- Truss
- Square
- Bolting
- Welding
- Carpenter
- Contractor
- Compression
- Sub Contractor
- Form
- Aggregate
- Mortar
- Lintels
- Mass
- Frame

REFERENCES:

Landers, Jack M., Construction: Materials, Methods, Careers, South Holland, Ill.: The Goodheart-Willcox Co., Inc., 1983.

Lux, Donald G., et.al., The World of Construction, Encino, CA.: Glencoe Publishing Co., 1982.

REFERENCE: 7.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Plumbing and Piping

MAJOR CONCEPT: Plumbing and piping are used to move liquids and gases throughout a structure.

TOPICS:

1. Plumbing Systems
2. Plumbing Fittings and Piping
3. Jobs of a Plumber
4. Installing Plumbing Systems

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify plumbing fittings and piping.
2. Describe the jobs of a plumber and a pipe fitter.
3. Describe potable water systems, fire fighting systems, and waste water systems.
4. Explain the process of joining copper, plastic, steel, and cast iron pipe.
5. Describe how to support piping.

CORE INSTRUCTIONAL ACTIVITIES:

1. Fit and join copper, steel, and/or iron pipe.
2. Support pipes and fittings onto a wall, ceiling, or floor.
3. Identify and use tools and equipment used in plumbing and piping.
4. Join copper and plastic pipe and fittings into a closed loop having a nipple that can be attached to a water supply or air compressor. Test the system for leaks with air before applying water.
5. Test the water pressure in school using a water pressure gauge.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design a plumbing system for a house or office building.
2. Plumb a bathroom and kitchen and install the fixtures.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Pipe Wrench
Pipe Die
Pipe Hanger
Pipe Cutter
Pipe Reamer
Steel Tape
Try Square
Air Compressor
Hacksaw
Pipe Dope
Reducer
Pipe Vice
Round File
Propane Torch
Striker (for torch)
Water Pressure Gauge
Soldering Gun

MATERIALS/CORE:

Pipe (copper, plastic, steel, cast iron)
Plastic Pipe Cement
Tees
Flanges
Spigot End
Soldering Flux
Solder
Ells
Bell End
Cutting Oil

TOOLS AND EQUIPMENT/ADVANCED:

See Core
Drafting Equipment

MATERIALS/ADVANCED:

Sink
Bathtub Fixture
Pipe/Fittings
Plumbing Drain
Toilet Fixture
Valves
Trap

APPLICATION OF TERMS:

Backing Boards
Cemented Joints
Fittings
Nipples
Plumber
Roughing In
Solder
Stand Pipe
Sweat Joints
Vent
Ells
Vent
Pipe Dope
Flanges
Bell Ends
Cleaning Drop
Flow Test
Pipe Fittings
Potable Water
Sanitary Sewer
Spigot
Storm Sewer
Trap
Reducer
Tees
Pipe Hanger
Pipe Die
Welding

REFERENCE:

Henak, Richard M., Exploring Construction, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1985.

REFERENCE: 7.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Heating/Air Conditioning/Ventilation

MAJOR CONCEPT: Heating, air conditioning, and ventilation systems are installed in structures to provide a comfortable and safe climate within.

TOPICS:

1. Heating Systems
2. Air Conditioning Systems
3. Ventilation Systems

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List five ways in which air can be changed or treated (heated, cooled, humidified, dehumidified, and filtered).
2. Discuss three devices that control temperature, humidity, or the flow of air in a room (thermostat, humidistat or humidity regulator, and damper).
3. Discuss conveying and recovery systems.

CORE INSTRUCTIONAL ACTIVITIES:

1. Using a wet/dry vacuum cleaner, demonstrate an air conveying system.
2. Using a wet/dry vacuum cleaner, demonstrate a recovery system and filter system.
3. Hang ductwork from the ceiling or a framework to demonstrate installing ducts.
4. Demonstrate how air can be treated using a heating unit, cooling unit, humidifier, dehumidifier, and filtering unit.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design a duct work system for exhausting fumes or dust from a machine in the laboratory.
2. Discuss how a thermostat works.
3. Design an air or liquid conveying system.
4. Design and make a humidifer and test its effectiveness using a sling psychrometer.
5. Experiment with different types of heating units and calculate the efficiency of each. (forced hot air/water, electric coil convection, kerosene, conduction, radiation, and solar heat. Heating units may be simulated by using inexpensive heating devices).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Framing Square
Awl
Dividers
Cold Chisel
Aviation Snips
Pan Brake
Round Stake
Wet-Dry Vacuum Cleaner
Wooden Mallet
Tinners Setting Hammer
Hand Groover
Center Punch
Slip Roll
Hand Seamer
Rivet Gun

MATERIALS/CORE:

28 Gauge Sheet Metal
Boot (1 piece, 5" x 27.75")
Duct (1 piece, 5" x 13")
Rivets
Scrap Soft Wood (2" x 4" x 12")
Cap (1 piece, 4" x 13.5")
Masking Tape

TOOLS AND EQUIPMENT/ADVANCED:

Sling Psychrometer
Sheet Metal Equipment as under "Core"
Various Heating Devices
Thermostat

MATERIALS/ADVANCED:

See heating/air conditioning and refrigeration instructor for materials, or obtain/fabricate simulated small heating units used in a much scaled down "living" space.

Materials for humidifier depending on design

APPLICATION OF TERMS:

Ventilating
Air Conditioning
Humidity
Dehumidifier
Treated Air
Polluted Air
Radiator
Pneumatic Conveying System
Fabricate
Perimeter Heating
Adhesives
Metal Fastener
Humidity Regulator
Damper
Draft
Duct Work
Exhaust
Pneumatic Recovery System
Ducts
Metal Seams

REFERENCE:

Henak, Richard M., Exploring Construction, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1985.

REFERENCE: 7.3

MAJOR TITLE: Construction Technology

UNIT TITLE: Electrical

MAJOR CONCEPT: Electrical systems distribute electricity throughout the structure to run appliances, machines, and other equipment.

TOPICS:

1. Electrical Power Systems
2. Panel Box
3. Branch Circuitry
4. Installing Electrical Power Systems
5. Color Coding
6. Electrical Codes

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify the components needed and describe the order for installing a power system in a structure.
2. Describe the purpose and operation of a service panel box.
3. Explain what a branch circuit is.
4. List types of cable, junction boxes, switches, tubing, and receptacles.
5. Use the color coding system to identify wires.
6. Install electrical circuits.

CORE INSTRUCTIONAL ACTIVITIES:

1. Wire the following electrical circuits on a circuit board or simulated wall section:
    a) switch and lamp circuit
    b) switch, lamp, and receptacle circuit
    c) two 3-way switches and a lamp circuit
    d) two 3-way switches, one 4-way switch, and a lamp
    e) two 3-way switches, receptacles, and a lamp
2. Find the service wire to your school and determine if it has a two or three wire system.
3. Locate the circuit breaker or fuse box at your lab and determine how many circuits it has. Determine the ampere rating of each circuit.
4. Make a list of materials used in a branch circuit in the school lab.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Plan and install three branch circuits for lamps, portable kitchen appliances, and a clothes dryer (30 amps.). Include where the wires will go, type of cable to be used, parts to be used, and installation on a breadboard or wall section.
2. Research a local electrical code and discuss the meaning of the requirements in class.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Wire Cutters
- Claw Hammer
- Steel Tape
- Needle Nose Pliers
- Staple Gun
- Adjustable Wrench
- Screwdrivers
- Slip Joint Pliers
- Wire Gauge
- Side Cutting Pliers
- Multimeter
- Electric Drill
- Hacksaw
- Knife

MATERIALS/CORE:

- Conduit
- Various Switches
- Junction Boxes
- Wire
- Circuit Breaker
- Wire Nuts
- Electrical Tape
- Receptacles
- Staples

TOOLS AND EQUIPMENT/ADVANCED:

- Copies of Local Electrical Codes
- Electrical Breadboard or Exposed Wall Section

MATERIALS/ADVANCED:

- Same as Core

APPLICATION OF TERMS:

- Branch Circuits
- Cable
- Inspector
- Junction Box
- Knockouts
- Load
- Main Switch
- Raceway
- Service Panel
- Ground Fault Circuit Interrupter
- Conductors
- Conductor Supports
- Conduit
- Controls
- Circuit Breaker
- Service Entrance
- Color Coding

REFERENCE:

Henak, Richard M., *Exploring Construction*, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1985.

REFERENCE: 7.4

MAJOR TITLE: Construction Technology

UNIT TITLE: Communications

MAJOR CONCEPT: Homes, schools, and office buildings must have a communications system.

TOPICS:

1. Wiring for Transmission of Sound, Video, and Sensor Information
2. Telephone Systems and Wiring Color Code
3. Monitoring Systems
4. Television Systems
5. Computer Systems
6. Intercom Systems

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe ways to transmit sound, video, and sensor information.
2. Design and wire a 2-button doorbell circuit.
3. Wire a two-way communication system.

CORE INSTRUCTIONAL ACTIVITIES:

1. Wire a sound system following a schematic.
2. Wire a doorbell following a schematic.
3. Wire a telephone circuit following a schematic.
4. Wire an intercom system following a schematic.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design and wire a sound system.
2. Design and wire a doorbell circuit.
3. Design and wire a telephone circuit.
4. Design and wire an intercom system.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Basic Electricity Experiment Kit
Kit of Standard Electrical Tools

MATERIALS/CORE:

Coax Cable
Solderless Connectors
Solder
Electrician's Tape

TOOLS AND EQUIPMENT/ADVANCED:

Same as Core

MATERIALS/ADVANCED:

Same as Core

APPLICATION OF TERMS:

- Coaxial Cable
- Sea Lanes
- Easement
- Modem
- Telephone Drop
- Radio Receiver
- Jack
- Satellite
- Communications Satellite
- Communications System
- Communication
- Computer Terminal
- Intercom
- Facsimile
- Television Monitor
- Mobile Unit
- Microwaves
- Satellite Dish
- Telegraph
- Radio Transmitter

REFERENCE:

Henak, Richard M., Exploring Construction, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1985.

REFERENCE: 8.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Building Codes and Permits

MAJOR CONCEPT: A builder must obtain a "building permit" before construction can begin.

TOPICS:

1. Building Codes
2. Zoning Laws
3. Permits
4. Legal Descriptions

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List four types of zones (residential, commercial, industrial, and agricultural) and discuss the general specifications of each.
2. Identify ten building codes commonly used in many communities.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the nature of building permits and building codes.
2. Research and record ten building codes (rules) in your community or in a nearby community.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Explain how a building permit is granted.
2. Explain how the building codes keep structures in compliance with zoning ordinances.
3. Discuss the zoning for the area where you live, or in the nearest community that has zoning codes.
4. Explain the way you would change the zoning in your city. (residential, commercial, industrial, agricultural)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Building Code Book
Zoning Law Book (nearest sizable community)

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

See Core

MATERIALS/ADVANCED:

None

APPLICATION OF TERMS:

- Code
- Residential
- Industrial
- Site
- Single Family Dwelling
- Multiple Family Dwellings
- Deed
- Lot Number
- Zoning
- Commercial
- Agricultural
- Building Permit
- Duplex Dwellings
- Land
- Legal Description
- Plats

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1985.

REFERENCE: 8.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Conducting Inspections and Getting Approval

MAJOR CONCEPT: Inspection begins when a building permit is issued and ends when the building is completed.

TOPICS:

Elements that are inspected (insulation, plumbing, framing, foundation, electrical and septic tanks).

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Name individuals or commissions that make inspections.
2. List steps for resolving financial claims due to structural faults.

CORE INSTRUCTIONAL ACTIVITIES:

1. Inspect the school building noting the following: materials used, methods used, and quality of work. (structure, electrical, plumbing and floor covering)
2. Write a warranty giving a guarantee that there are no defects.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Develop an inspection checklist and check the materials, methods, and quality pertaining to the school building (plumbing, electrical, structure, and floors).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Building Code Manuals
Building Permit Examples

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

Building Code Manuals

MATERIALS/ADVANCED:

None

APPLICATION OF TERMS:

- Approval Form
- Final Payment
- Material Inspection
- Methods Inspection
- Quality Inspection
- Release of Lien
- Certificate of Completion
- Manuals
- Mechanic's Lien
- Negotiation
- Release of Claim
- Warranty

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, Ill.: The Goodheart-Willcox Company, 1985.

REFERENCE: 9.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Roofing

MAJOR CONCEPT: Roofs are essential to protect the inside of a structure from wind, rain, and snow.

TOPICS:

1. Built-up roofs
2. Types of roof coverings (shingle, felt paper, metal, asphalt and gravel, wood, tin, copper, fiberglass)
3. Installing roofs

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Discuss the advantages and disadvantages of a built-up roof.
2. List three types of roof coverings.
3. Install roofing shingles.

CORE INSTRUCTIONAL ACTIVITIES:

1. Determine what kind of roof your school has and explain how it was installed.
2. Build a portion of a built-up roof in class.
3. Install various shingle types on a simulated roof section.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Make cedar shingles and install on a roof section.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Basic Carpenters Tool Kit

MATERIALS/CORE:

Roofing Materials
Staples
Plywood Sheet
Nails
Adhesives

TOOLS AND EQUIPMENT/ADVANCED:

Draw Knife
Mallet
Ax

MATERIALS/ADVANCED:

Cedar for Shingles
Plywood Sheet
Nails
Roofing Felt

APPLICATION OF TERMS:

Flat Roof
Valley
Gable
Plies
Roof Deck
Hip
Flashings
Membrane
Shed
Vapor Barrier
Adhesive
Gravel
Pitched Roof
Built-up Roof
Gambrel
Roofing Felt
Bitumen
Mansard
Insulation
Horizontal Gutter
Shingles
Expanded Joints

REFERENCE:

Henak, Richard M., Exploring Construction, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1985.

REFERENCE: 9.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Exterior Walls

MAJOR CONCEPT: Structures are enclosed to keep out wind, rain, cold, sun, heat, and dust as well as add beauty to the structure.

TOPICS:

1. Masonry
2. Wood
3. Paneling
4. Metal
5. Doors and Windows

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List three materials used to enclose exterior walls.
2. Describe how doors and windows are installed.
3. Discuss exterior wall coverings for decoration and insulation.
4. Install a door and/or window.
5. Mix stucco and apply it to a concrete block wall.
6. Lay a portion of a brick wall.

CORE INSTRUCTIONAL ACTIVITIES:

1. Frame a door and/or window.
2. Install a door and/or window.
3. Mix stucco and apply.
4. Lay a portion of a brick wall.
5. Install a doorknob and/or deadbolt lock.
6. Install one quarter inch paneling on a wall section.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Enclose a curtain wall with drywall. Tape and finish the seams. (can be miniaturized)
2. Install a plain bevel, channel sliplock, tongue and groove, and/or board and batten siding.
3. Demonstrate the application of stucco.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Claw Hammer
- Nail Set
- Handsaw
- Back Saw
- T-bevel
- Block Plane
- Steel Tape
- Concrete Mixing Tray
- High Speed Drill Bits
- Lockset
- Chalk Line
- Circular Saw
- Jig Saw
- Router
- Electric Drill
- Reciprocating Saw
- Screw Gun
- Masonry Trowel
- Level
- Framing Square
- Try Square
- Combination Square
- Staple Gun
- Concrete Hoe
- Scaffold
- Door/Window

MATERIALS/CORE:

- Brick
- Paneling
- Adhesives
- Cement
- Mortar
- Wood
- Nails
- Staples
- Sand
- Stucco Cement
- Screws
- Concrete Block
- Gravel

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATION OF TERMS:

- Caulk
- Siding
- Threshold
- Veneer
- Masonry Bricks
- Ribbon Stone
- Stucco Cement
- Aggregates
- Concrete Hoe
- Router
- Curtain Walls
- Lintel
- Face Brick
- Window Frame
- Bonds
- Scaffold
- Stretcher Bonds
- Lapped Boards
- Masonry Trowel
- Rough Openings
- Common Brick
- Door Frame
- Mortar
- Tooled Joints
- Brick Layers
- Cored Block
- Adhesives
- Masonry

REFERENCE:

Henak, Richard M., Exploring Construction, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1985.

REFERENCE: 9.3

MAJOR TITLE: Construction Technology

UNIT TITLE: Insulating

MAJOR CONCEPT: Insulation is used in a building to resist the flow of heat either into or out of a building, to retard the spread of fire, to absorb noise, and to serve as a vapor barrier.

TOPICS:

1. Heat Transfer
2. Types of Insulation (reflective, rigid board, batts and blankets, loose fill)
3. Installing Insulation
4. Vapor Barrier

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List three types of heat transfer (conduction, convection, and radiation).
2. Explain the function of a vapor barrier.
3. Explain the function of weather stripping.
4. List four kinds of insulation.
5. Identify how insulating materials are grouped.

CORE INSTRUCTIONAL ACTIVITIES:

1. Demonstrate the three types of heat transfer using a small toaster oven, or other heat source that illustrates conduction, convection, and radiation (see Activity 5).
2. Demonstrate the function of a vapor barrier.
3. Demonstrate the function of weather stripping.
4. Install various types of insulation on a simulated wall.
5. Make a small structure. Use insulating material from each insulation group to insulate the structure (mineral products, vegetable products, and metallic products).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design an insulation system which reduces conduction, convection, and radiation to control the flow of heat in a structure.
2. Test gypsum, fiberglass, wood, and metal to determine which is the best insulating material.
3. Research the function of a vapor barrier and brainstorm ways to improve on existing technology. Write down ideas and present them to the class.
4. Experiment with different types and thicknesses of wall insulation and record results. (Use a box frame that can be insulated using standard quantity of ice inside. Measure melting time.)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Staple Gun
- Utility Knife
- Claw Hammer
- Steel Tape
- Toaster Oven
- Straight Edge
- Electric Drill

MATERIALS/CORE:

- Various Insulating and Non-Insulating Materials
- Staples
- Weather Stripping
- Masking Tape

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATION OF TERMS:

- Batt/Blankets
- Insulation
- Loose Fill
- Heat Rays
- Rigid Board
- Weather Stripping
- Air Flow
- Conduction
- Convection
- Radiation
- Heat Transfer
- Reflection
- Insulating Materials
- Condensation
- Porous
- Sealed
- Capacity
- Vapor Barrier

REFERENCE:

Henak, Richard M., Exploring Construction, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1985.

REFERENCE: 9.4

MAJOR TITLE: Construction Technology

UNIT TITLE: Interior Walls, Floors, and Ceilings

MAJOR CONCEPT: Interior wall, floor, and ceiling coverings improve appearance, sound insulation, and allow temperature control.

TOPICS:

1. Wall Coverings
2. Floor Coverings
3. Ceiling Coverings

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Install subflooring and underlayment.
2. Install drywall and fill the joints with tape and joint compound.
3. Install ceiling tile.

CORE INSTRUCTIONAL ACTIVITIES:

1. Install subflooring and underlayment on a joist frame.
2. Apply floor coverings to an underlayment.
3. Fasten gypsum wallboard to a wall section using nails, screws, staples and/or mastic. Cover joints and dents with tape and joint compound. Finish the joints.
4. Install ceiling tile on a ceiling section.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Panel a wall section.
2. Apply ceramic tile to a floor and/or wall section.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Standard Carpenter's Tools plus Spackling Trowel

MATERIALS/CORE:

Staples
Molding
Sandpaper
Nails
Ceiling Tile
Gypsum Wallboard
Plywood Flooring
Joint Compound
Joint Tape

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Wood Paneling
Ceramic Grout
Plywood
Tile Mystic
Ceramic Tile

APPLICATION OF TERMS:

- Plaster
- Simulated Wood
- Furring Strip
- Acoustic Tile
- Translucent Panels
- Linoleum
- Shim
- Plaster Board
- Vinyl Coating
- Tile
- Mastic
- Subfloor
- Durability
- Trimming
- Wood Strip Floorings
- Adhesive
- Lath
- Drywall
- Resilient Flooring
- Tongue and Groove

REFERENCE:

Henak, Richard M., Exploring Construction, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1985.

REFERENCE: 10.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Painting, Decorating, and Installing Accessories

MAJOR CONCEPT: A construction project is not complete until painting, decorating, and adding accessories has been done.

TOPICS:

1. Painting
2. Decorating (paneling, wallpaper, carpet, etc.)
3. Installing accessories (cabinets, kitchen accessories, bathroom accessories, electrical fixtures, etc.)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Paint a wall and ceiling section.
2. Carpet a floor section.
3. Install vinyl flooring.
4. Install wood trim.
5. Install a light fixture.

CORE INSTRUCTIONAL ACTIVITIES:

1. Apply paint to a ceiling/wall section.
2. Lay carpet on an underlayment of the floor section.
3. Measure, cut, and glue vinyl to an underlayment of the floor section.
4. Nail trim to the carpeted/linoleum covered section.
5. Wire a light fixture.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Hang wall paper on a wall section.
2. Hang a premanufactured cabinet section.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Utility Knife
Mock Building
Roller with Handles
Steel Tape
Back Saw
Carpet Kicker
Light Fixture
Drop Cloth
Roller Pans

MATERIALS/CORE:

Carpet Nails
Paint
Vinyl
Mastic
Wire Nuts
Trim
Light Fixture
Ceiling Tiles
Carpet
Paint Brushes

TOOLS AND EQUIPMENT/ADVANCED:

- Ladder
- Wallpaper Water Tray

MATERIALS/ADVANCED:

- Pre-glued Wall Paper
- Prefabricated Cabinet (may be made by class)

APPLICATION OF TERMS:

- Flush
- Solvent
- Flow
- Glossy
- Enamel
- Drop Cloth
- Thinning
- Joint
- Primer
- Flat
- Stroke
- Overhang

REFERENCE:

Landers, Jack M., Construction: Materials, Methods, Careers, South Holland, Ill.: The Goodheart-Willcox Co., Inc., 1983.

Lux, Donald G. et.al., World of Construction, Encino, CA: Glencoe Publishing Co., 1982.

REFERENCE: 11.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Cleaning-up, Cutting Accesses, and Landscaping

MAJOR CONCEPT: When the structure is complete the outside area must be cleaned of all debris, accesses cut, and grounds landscaped.

TOPICS:

1. Clean-up
2. Cutting Accesses
3. Landscaping

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe landscaping and its applications.
2. Design a landscaping plan.
3. List materials used for walkways, driveways, sidewalks, and platforms.
4. List tools and equipment used to clean-up a site.
5. Specify plants and materials used as ground cover.

CORE INSTRUCTIONAL ACTIVITIES:

1. Landscape an area of the school.
2. Make a small walkway, sidewalk, driveway or platform at the school, or perform these activities using a model. (plaster of Paris could be utilized)
3. Prepare a landscaping plan for a model home, office building, or industrial plant. Include slopes, accesses, sod, shrubs, trees, fountains, etc.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Design a landscaping plan for the school.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Shovel
Trowel
Sandbox
Hoe
Garden Rake

MATERIALS/CORE:

Concrete
Sod
Treated Lumber
Plants

TOOLS AND EQUIPMENT/ADVANCED:

Standard Drafting Equipment
CAD System

MATERIALS/ADVANCED:

Computer Paper
Drafting Paper

APPLICATION OF TERMS:

- Access
- Cleaning
- Final Earthwork
- Fixtures
- Ground Cover
- Guy Wires
- Landscape Plan
- Landscaping
- Mulch
- Planting Schedule

REFERENCE:

Henak, Richard M., Exploring Construction, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1985.

REFERENCE: 12.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Maintaining, Servicing, and Changing the Constructed Project

MAJOR CONCEPT: Maintaining, servicing, and changing the constructed product involves keeping the structure in good working condition, and sometimes altering it to meet new conditions or consumer demands.

TOPICS:

1. Maintaining the Product
2. Repairing the Product
3. Protecting the Product
4. Altering the Product
5. Restoring the Product

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Draw up a schedule for servicing a given constructed product.
2. Discuss what restoring a structure might involve (teacher provides structure examples).
3. Make alterations to a project.
4. List three things that are involved in protecting a given constructed product (fences, patrols, and monitoring devices).

CORE INSTRUCTIONAL ACTIVITIES:

1. Plan a schedule for servicing a constructed product (eg. school, home, bridge).
2. Make alterations to a model structure.
3. Restore a model structure.
4. Draw up a protection plan for a constructed product.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Plan a servicing system to service a proposed project.
2. Draw a remodeling plan for the industrial technology lab to modernize it.
3. Make an estimate for interior repairs for a portion of the school.
4. Make an estimate for the exterior repairs for a portion of the school.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Carpenter's Tool Kit
Electrician's Tool Kit
Plumber's Tool Kit
(other items depending on activity selected)

MATERIALS/CORE:

Materials depending on activity selected

TOOLS AND EQUIPMENT/ADVANCED:

Drafting Equipment
Computer Aided Drafting (CAD) System

MATERIALS/ADVANCED:

Drafting Paper
Material Price Catalogs

APPLICATION OF TERMS:

- Servicing
- Postprocessing
- Maintaining
- Altering
- Deterioration
- Payback
- Warranty
- Schedule Maintenance
- Processing
- Operating
- Repairing
- Installing
- Changing
- Restoring
- Routine Maintenance

REFERENCES:

CITE (CO-G-004) Estimating Interior Repairs - CITE (CO-G-006) Estimating Exterior Repairs, Ray Shakelford and Bruce Cannaday, Department of Industry and Technology, Ball State University, Muncie, IN 47306.

Henak, Richard M., Exploring Construction, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1985.

REFERENCE: 13.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Future of Construction

MAJOR CONCEPT: Three trends seem to be emerging in the construction industry: modular/prefabricated components, self-contained communities, and construction in space.

TOPICS:

1. Modular/Prefabricated Components
2. Self-contained Communities
3. Construction in Space

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Discuss how the use of modular/prefabricated components combines manufacturing with construction processes.
2. List the advantages/disadvantages of self-contained communities.
3. Discuss the necessities for construction in space (travel, training, physical requirements, etc.).

CORE INSTRUCTIONAL ACTIVITIES:

1. Manufacture miniature roof trusses of various types and install them on a model building.
2. Design a self-contained community.
3. Manufacture miniature components for a large space structure. Assemble them wearing a simulated space suit (wearing at least three layers of heavy clothing, a football helmet, and ski gloves or boxing gloves).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design, manufacture, and assemble modules for a miniature motel or hotel.
2. Design and build a miniature self-contained community.
3. Design and construct a large folding structure that could be unfolded to make a living area in space. Unfold it in simulated space gear. (See Core Activity 3.)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Standard Construction Equipment

MATERIALS/CORE:

Wood Strips
Brads
Heavy Clothes to Layer
Glue
Mock Structure
Ski/Boxing Gloves

TOOLS AND EQUIPMENT/ADVANCED:

Standard Woodworking Equipment

MATERIALS/ADVANCED:

- Lumber
- Screws
- Ski/Boxing Gloves
- Clothes to Layer
- Glue

APPLICATION OF TERMS:

- Self-contained Community
- Modular
- Prefabricated
- Encapsulated
- Laminates
- Precast

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1985.

NASA Publications, Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

CONSTRUCTION TECHNOLOGY

Standard Tools and Equipment

- Claw Hammers
- Pipe Die
- Pipe Wrenches
- Try Square
- Pipe Vice
- Striker
- Framing Square
- Cold Chisel
- Drill Press
- Pliers
- Roller Pan
- Ladder
- Putty Knife
- Motorized Miter Box
- Nail Set
- Ax
- Router
- Mortar Hoe
- Needle Nose Pliers
- Linesman's Pliers
- Wooden Mallet
- Center Punch
- Back Saw
- T-squares
- Compass (directional)
- Architectural Scale
- Drafting Table
- Radial Arm Saw
- Drill Bit Sets
- High Speed Twist Drill Set
- Spade
- Carbide Tipped Twist Drill Set
- Crosscut Saws
- Wire Strippers
- Pipe Cutter
- Air Compressor
- Round File
- Chain Wrench
- Awl
- Aviation Snips
- Band Saw
- Utility Knife
- Trowel
- Hoe
- Coping Saw
- Circular Saw
- Jig Saw
- T-bevel
- Scaffold
- Wire Cutters
- Multimeter
- Ream
- Tinner's Hammer
- Slip Roll
- Tin Snips
- 45° Triangle
- Erasing Shield
- 30°-60° Triangle
- Table Saw
- Screwdriver
- Chalk Line
- Combination Square
- Belt Sander
- Safety Glasses
- Soldering Guns
- Pipe Reamer
- Hacksaws
- Propane Torch
- Stakes
- Dividers
- Wet/dry Vacuum
- Hole Saw
- Paint roller w/handle
- Shovel
- Rake
- Staple Gun
- Joist Frame
- Mallet
- Block Plane
- Screw Gun
- Wire Gauge
- Buckets
- Round Stake
- Hand Groover
- Hand Seamer
- Scales
- Compass (drawing)
- Ruler
- Drafting Brush
- Work Benches w/vices
- Level
- Electric Drill
- Auger Bit Set
- Jib Saw

Specialized Tools and Equipment

- Laser Kit
- Level Rod
- Compass (Directional)
- Carpet Kicker
- Torpedo Level
- Slip Roll
- Soil Compactor
- Split-barrel Soil Sampler
- Football Helmet
- Heavy (boxer or ski) Gloves
- Toaster Oven or other heat devices
- CAD System to include Keyboard, CPU (128K RAM), 2 Disk Drives, Digitizer, Printer/Plotter
- Line Level
- Calculator
- Level Bar Pin
- Tile Cutter
- Multimeter
- Soil Tester
- Resistivity Meter
- Space Heater
- Sling Psychrometer
- Water Pressure Gauge
- Transit/Tripod
- Pan Brake
- Ladder
- Kitchen Scale
- Hydraulic Trainer
- Liquid Limit Device
- Wet/Dry Vacuum
- Tubing Cutter

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MANUFACTURING TECHNOLOGY
RECOMMENDED INSTRUCTIONAL TIME

		9 WKS	18 WKS	36 WKS
1.	Management			
1.1	Manufactured Products	1	1	2
1.2	The Manufacturing Enterprise	1	1	1
1.3	The Manufacturing System	1	2	5
1.4	Incorporating a Business	1	1	2
1.5	Developing a Management Structure	1	1	2
1.6	Design-Analysis Method		1	1
1.7	Product Design	1	4	7
1.8	Research and Development	1	1	2
1.9	Product Engineering	1	4	8
2.	Management and Personnel			
2.1	Establishing Accident Prevention Programs	2	3	6
2.2	Hiring		1	2
2.3	Training	1	1	2
2.4	Organized Labor and Collective Bargaining		1	1
3.	Management and Production			
3.1	Extracting Raw Materials	2	3	3
3.2	Making Basic Materials		1	2
3.3	Separation by Chip Removal	1	3	12
3.4	Shearing	1	5	10
3.5	Separation by Other Processes	2	5	12
3.6	Casting and Molding	2	6	10
3.7	Forming	2	5	10
3.8	Conditioning	1	5	10
3.9	Combining	2	5	10
3.10	Coating	1	5	10
3.11	Production Management	2	2	5
3.12	Tooling Up for Production	5	5	12
3.13	Inventory Control	1	2	5
3.14	Quality Control	2	3	6
3.15	Producing the Product	4	5	5
3.16	Packaging	3	4	8
4.	Management			
4.1	Maintaining and Servicing Products	1	2	6
4.2	Marketing and Distribution	1	1	2
4.3	Liquidating a Company	1	1	1
		45	90	180
		Total Hours		

NOTES

REFERENCE: 1.1

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Manufactured Products

MAJOR CONCEPT: Manufacturing provides us with products that make our lives easier.

TOPICS:

1. Evolution of Manufacturing
2. Manufacturing and Non-manufacturing
3. Importance of Manufactured Goods in Our Society
4. Durable and Non-durable Goods
5. How Products Are Manufactured
6. Impact of New Technologies on Manufacturing
7. Orientation to This Study in Manufacturing

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Trace the evolution of manufacturing by explaining events that advanced the technology used in manufacturing.
2. Differentiate between manufactured and non-manufactured goods.
3. Compare and contrast society's use of manufactured and non-manufactured goods.
4. Identify manufactured durable and non-durable goods.
5. Discuss how manufactured products are made.
6. Participate in group research of a recent process development in manufacturing technology.
7. Describe what will be learned in this course in manufacturing.

CORE INSTRUCTIONAL ACTIVITIES:

1. Produce an illustrated time line that traces the historical development of a manufactured product.
2. Discuss manufactured and non-manufactured goods and durable and non-durable goods provided by the instructor.
3. Describe in a short paper what life was like one hundred years ago.
4. Prepare a display of group research on a recent process development in manufacturing technology.
5. Participate in a discussion on what will be learned in this course in manufacturing.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Identify an example of durable goods and discuss design changes that would make the product more futuristic.
2. Prepare a display of research on a recent process development in manufacturing technology.
3. Discuss the technologies essential to the development of selected recent processes.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Art Supplies (scissors, brushes, markers)

MATERIALS/CORE:

Magazines
Tape
Art Supplies
Paper
Glue

TOOLS AND EQUIPMENT/ADVANCED:

Same as Core

MATERIALS/ADVANCED:

Same as Core

APPLICATION OF TERMS:

Durable Goods
Product
Non-Manufactured
Manufacturing Technology
Non-Durable Goods
Technology
Product Evolution

REFERENCES:

Groneman, C. H. and Grannis, G. E., Exploring the Industries, New York: Delmar Publishers, 1981.

REFERENCE: 1.2

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: The Manufacturing Enterprise

MAJOR CONCEPT: There are three major types of manufacturing organizations: proprietorships, partnerships, and corporations.

TOPICS:

1. Reasons for Starting a Manufacturing Enterprise
2. Proprietorships
3. Partnerships
4. Corporations
5. Advantages and Disadvantages of Each

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain why manufacturing enterprises are formed.
2. List the duties and responsibilities of proprietors and of partners.
3. Explain why a corporation can usually expand faster than a proprietorship or a partnership.
4. List advantages and disadvantages for each kind of manufacturing enterprise.
5. Identify the elements that distinguish a corporation from other forms of organization.

CORE INSTRUCTIONAL ACTIVITIES:

1. After a class discussion and using a master list, select the duties and responsibilities of a proprietor, a partner, and a stockholder.
2. Divide the duties and responsibilities into advantages and disadvantages.
3. Participate in a class vote of the preferred type of enterprise for selected products and explain in a paragraph why a particular enterprise was selected for a particular product.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Draw an organizational chart for a corporation and assign personnel to each position.
2. Participate in class election of a Board of Directors.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

Handout (master list of duties and responsibilities) See reference.

TOOLS AND EQUIPMENT/ADVANCED:

None

MATERIALS/ADVANCED:

Poster Board Markers
Ballots

APPLICATION OF TERMS:

Proprietorship	Partnership
Corporation	Board of Directors
Officers	Job Duties
Organization Chart	Capital
Stock	

REFERENCES:

Fales, J. et.al., Manufacturing: A Basic Test for Industrial Arts, Peoria, Ill.: Bennett and McKnight Publishing, 1980.

REFERENCE: 1.3

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: The Manufacturing System

MAJOR CONCEPT: All systems, including the manufacturing system, are made up of three parts: inputs, processes, and outputs. Systems enable companies to reach goals.

TOPICS:

1. Types of Systems (i.e.: digestive, railway, filing, and production)
2. Relationship of System and Efficiency
3. The Six Inputs to Manufacturing (natural resources, human resources, capital, knowledge, finance, and energy)
4. Manufacturing Technologies (production technology, management technology, and personnel technology)
5. Manufacturing Outputs (consumer products, industrial products, military products, and other outputs)
6. Manufacturing Goals (company's goals and society's goals)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify the inputs, processes, and outputs in relation to common types of systems.
2. Identify the inputs, processes, outputs, and goals in relation to manufacturing systems.
3. Identify and discuss the six inputs to manufacturing.
4. Describe sources of the inputs to manufacturing.
5. Calculate the necessary inputs to produce a collated paper product.
6. Describe what is involved in production technology, management technology, and personnel technology.
7. Categorize products according to the end user type.
8. Produce a recycled product (i.e. paper).
9. Describe how manufacturing can positively and negatively affect society.
10. Explain what happens when manufacturing companies do not make a profit.
11. Identify some of the inputs, processes, and outputs of future class laboratory activities.

CORE INSTRUCTIONAL ACTIVITIES:

1. Working in groups, identify a system other than manufacturing and prepare a chart showing the three parts of that system.
2. Working in groups, identify a type of manufacturing industry and prepare a chart showing elements in the three parts of that industry's manufacturing system.
3. List and describe the six inputs to manufacturing.
4. Categorize a given list of resources into the six types of inputs.
5. Determine and calculate the inputs needed to produce a specific number of collated paper products.
6. Produce a collated paper product, such as a handout, booklet, or test.

7. Discuss the practices involved in production technology, management technology, and personnel technology.
8. From an interview conducted with an acquaintance, write a description of the duties of a worker employed in either the management or the production part of manufacturing.
9. Participate in role-playing interviews for selected positions in a manufacturing company.
10. Categorize a teacher-provided list of products according to the end user.
11. Recycle used paper products to produce a usable sheet of paper.
12. Make fire starter strips from sawdust, glue, and wax paper.
13. Discuss profit and how manufacturing companies use profits.
14. Write a paragraph to describe how unemployment affects society.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Invent an idea for a product and prepare a chart illustrating the elements required in the system for producing that product.
2. Create a computerized spreadsheet showing the inputs used in producing the product in Core Activity 6.
3. Participate in videotaped role-playing interviews for selected positions in a manufacturing company.
4. Bring scrap material to class and recycle it to produce a usable product: (aluminum scrap to make ingot, and lead scrap to make fishing weights).
5. Contact a local industry to determine what is done with the waste materials.
6. Clip news articles pertaining to hazardous waste management.
7. Participate in a class collection of used aluminum products that will be sold to an aluminum recycling plant.
8. Use course catalogs from local institutions of higher learning to determine what courses are offered in high tech industrial training and retraining.
9. Contact the local Chamber of Commerce to find out how new industry is attracted to the area and present the information to the class.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Selected product examples
Stapler
Paper Making Equipment (see reference)
Markers
Spirit Duplicator

MATERIALS/CORE:

Construction paper
Scrap Paper
Handout (list of resources: see reference)
Handout (product list: see reference)
Materials for Paper Recycling (see reference)
Spirit Masters

TOOLS AND EQUIPMENT/ADVANCED:

Computer and Spreadsheet Program
Video Camera
VCR
TV
Video Tape
Tools as per production activity selected
Junior College and Technical School Course Catalogs

MATERIALS/ADVANCED:

Computer Paper
Current Newspapers and Magazines

APPLICATION OF TERMS:

System
Process
Output
Capital
Finance
Planning
Controlling
Training
Forming
Consumer Products
Military Products
Waste
Recycle
Profit
Expenses
Relocation
Input
Goals
Resources
Labor
Energy
Organizing
Hiring
Separating
Combining
Industrial Products
Scrap
Hazardous Materials
By-product
Investment
Unemployment
Chamber of Commerce

REFERENCES:

Wright, R. T., and Henak, R. M., Exploring Production, South Holland, Illinois: Goodheart-Willcox, 1985.

Wright, R. T., and Henak, R. M., Industrial Arts, Skills, Tools and Careers, South Holland, Illinois: Goodheart-Willcox, 1981.

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REFERENCE: 1.4

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Incorporating a Business

MAJOR CONCEPT: Before any manufacturing corporation can be fully organized, it must become a legal company.

TOPICS:

Steps in Incorporating a Business
1. Prepare and File Articles of Incorporation
2. Prepare a Set of Bylaws
3. Receive Charter From the State
4. Elect a Board of Directors

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Identify the steps necessary to incorporate a business.
2. Prepare the records needed to obtain a corporation charter.
3. Interpret a corporate organization chart.

CORE INSTRUCTIONAL ACTIVITIES:
1. Prepare the Articles of Incorporation (determine: the name of company, proposed activities, names and addresses of incorporators, location of company, value, and type of stock to be issued).
2. Prepare and approve bylaws (determine: date and place of stockholder meetings, date and place of meetings of the Board of Directors, corporate officers and their duties, terms of office, types of proposals to be approved by stockholders, and method used to change bylaws).
3. Participate in election of the Board of Directors.
4. Discuss one or more examples of corporate organizational charts.
5. Prepare an organizational chart for the company.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Same as Core
2. Design certificate of incorporation using a computer program.
3. Design stock certificates using a computer program.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Examples of Corporate Organizational Charts, Stock Certificates, and Bylaws

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

Computer System   Certificate Maker Program

MATERIALS/ADVANCED:

None

APPLICATION OF TERMS:

Bylaws
Charter
Stockholder
Incorporation
Board of Directors
Stock Certificate
Corporation
Stock

REFERENCES:

Fales, J., Sheets, E., Mervich, G., Dinan, J., Manufacturing: A Basic Text, Peoria, Illinois: Bennett and McKnight Publishing Co., 1986.

Wright, R. T., Manufacturing, South Holland, Illinois: Goodheart-Willcox, 1984.

REFERENCE: 1.5

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Developing a Management Structure

MAJOR CONCEPT: Structuring a corporation involves identifying the jobs in the company and organizing these jobs according to the job responsibilities.

TOPICS:

1. Delegation of Responsibility
2. Lines of Authority
3. Availability of Personnel
4. Organizational Plan

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Discuss lines of authority, delegation of authority, and availability of personnel.
2. List and describe the components of a manufacturing company's organizational plan. (organizational chart, job description manual, and employee handbook).

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify the positions needed in the class manufacturing corporation.
2. Prepare the organizational chart for the class manufacturing company.
3. Prepare the job description manual to be used by the class manufacturing company.
4. Prepare an employee handbook to be used by the class manufacturing company.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Same as Core
2. Use a word processing program to generate a finished copy of the job description manuals.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Markers
Rulers

MATERIALS/CORE:

Poster Board

TOOLS AND EQUIPMENT/ADVANCED:

Computer System
Word Processing Program

MATERIALS/ADVANCED:

Computer Paper

APPLICATION OF TERMS:

- President
- Vice President
- Engineers
- Lines of Authority
- Managers
- Supervisors
- Delegation
- Manual

REFERENCES:

Wright, R. T., Manufacturing, South Holland, Illinois: Goodheart-Willcox, 1984.

REFERENCE: 1.6

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Design Analysis Method

MAJOR CONCEPT: Problem solving techniques are used in product design.

TOPICS:

1. Justification for Design Analysis Method
2. Steps in Design Analysis
    a) State the Problem
    b) Identify Specifications/Requirements
    c) Develop Solutions
    d) Experiment
    e) Select Final Solutions

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain how the Design Analysis Method makes manufacturing design problems easier to solve.
2. List and describe the five steps in the Design Analysis Method of designing manufactured products.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss what might be involved in design analysis of different products. (i.e. plastic model helicopter and its package)
2. Prepare a statement of the problem and list the specifications/requirements (steps a and b) for the product design of a student generated product idea.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Prepare a statement of the problem, a list of the specifications/requirements, develop solutions, and make sketches (topic steps a, b, and c) for the product design of a student-generated product idea.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

Sketching Tools (graph paper, pencils, rulers, etc.)

MATERIALS/ADVANCED:

Sketching Paper

APPLICATION OF TERMS:

- Function
- Specifications
- Experimentation
- Final Design Solution
- Materials
- Design-Analysis Method
- Alternate Design Solution

REFERENCES:

Lindbeck, J. R. and Lathrop, I. T., General Industry and Technology, Encino, CA.: Bennett and McKnight, 1986.

REFERENCE: 1.7

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Product Design

MAJOR CONCEPT: Designers follow steps in product design as part of the product development cycle.

TOPICS:

1. Design Approaches (production and consumer approach)
2. Identifying Consumer Wants and Needs
3. Elements of Design (i.e. form, color texture, size, and function)
4. Principles of Design
5. Preliminary Design
6. Detail Designs

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify and describe two approaches that manufacturing companies use in developing new products.
2. List ten products that were developed by the consumer approach and ten products that were developed by the production approach.
3. Generate product ideas for both approaches to design.
4. Discuss the goals of product design.
5. Prepare a list of possible products to be manufactured in class.
6. Identify and describe consumer survey techniques.
7. Identify the elements of design.
8. Discuss principles of design.
9. Describe the steps involved in product design.
10. Produce pictorial sketches of a product to be manufactured (oblique, cabinet, perspective, etc.).
11. Produce working drawings from sketches.

CORE INSTRUCTIONAL ACTIVITIES:

1. Examine catalogs and sales advertisements to identify products that are created by either a production or a consumer design approach.
2. Work in groups to form an idea for a product that can be designed and produced using the consumer method of product design.
3. Work in groups to form an idea for a product that can be designed and produced using the production method of product development.
4. Prepare a list of products that can be manufactured in the lab.
5. Prepare a survey form to identify which of the products in activity number one are the types of products that prospective consumers may want or need.
6. Conduct the survey among class members.
7. Compare group findings to determine the type of product and cost range for future production of the product.
8. Identify and evaluate the various elements of design used on teacher-provided examples (see application of terms).
9. Identify and evaluate the principles of design used on teacher-provided examples of products (chair, desk, model car, tools in the lab).

10. Construct a chart to display the designs of models and prototypes that will be made in the engineering phase.
11. Use graph paper to make rough sketches of a selected product (can be the product to be used in Production Unit).
12. Use graph paper to refine rough sketches of products from activity number one.
13. Produce dimensioned design sketches of the product(s).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Complete core activities four and five and use the form to conduct a random survey of the student body, the faculty, parents, and neighbors.
2. Prepare a design analysis of a teacher or student-provided product (appearance, function, durability, safety, and manufacturing feasibility).
3. Sketch preliminary designs for a selected product.
4. Use drafting equipment to generate preliminary drawings for a selected product.
5. Use Computer Aided Drafting (CAD) system to design preliminary drawings for a manufactured product.
6. Refine preliminary sketches and drawings using a Computer Aided Drafting (CAD) system.
7. Generate detailed design drawings using a Computer Aided Drafting (CAD) system.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Catalogs and Sales Ads
Markers
Drawing Pencils
Product Examples
Rulers
Drafting Equipment

MATERIALS/CORE:

Sample Survey Forms (see references)
Poster Board
Advertisements
Magazines
Graph Paper

TOOLS AND EQUIPMENT/ADVANCED:

Product Examples
Drafting Equipment
Computer Aided Drafting (CAD) System

MATERIALS/ADVANCED:

Assorted Consumer Guides
Drawing Paper

APPLICATION OF TERMS:

- Needs
- Ideas
- Production Approach
- Survey
- Feasibility
- Forms
- Texture
- Function
- Variety
- Balance
- Design Factors
- Sketch
- Oblique
- Perspective
- Scale
- Detail Drawings
- Assembly Drawings
- Wants
- Consumer Approach
- Data
- Cost Analysis
- Lines
- Shapes
- Color
- Unity
- Proportion
- Consumer Guides
- Computer Aided Drafting (CAD)
- Pictorial
- Cabinet Drawing
- Graph Paper
- Dimensions
- Working Drawings
- Exploded View Drawings

REFERENCES:

Groneman, C. H. and Grannis, G. C., Exploring the Industries, Albany, New York: Delmar Publishers, 1981.

Lindbeck, J. R. and Lathrop, I. T., General Industry and Technology, Encino, CA.: Glencoe Publishing Co., 1986.

Wright, R. T. and Henak, R. M., Exploring Production, South Holland, Illinois: Goodheart-Willcox, 1985.

Wright, R. T., Manufacturing, South Holland, Illinois: Goodheart-Willcox, 1976.

NOTES

REFERENCE: 1.8

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Research and Development

MAJOR CONCEPT: Research and Development is the process by which new materials, processes and products are derived through retrieving information, describing existing things or ideas, and experimentation.

TOPICS:

1. Research Methods (retrieve, describe, and experiment)
2. Use of Research Results (materials and processes)
3. Destructive and Non-destructive Testing

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Use the three main ways of conducting research (retrieving, describing, and experimenting) in developing the class product.
2. Analyze research data.
3. Select the best materials for the class product.
4. Perform various destructive and non-destructive tests on materials that may be used in the class product.

CORE INSTRUCTIONAL ACTIVITIES:

1. Retrieve information about the class product from catalogs, magazines, books, and other sources.
2. Describe a selection of teacher-supplied materials in terms of weight, color, texture, and ease of separation and forming.
3. Perform destructive and non-destructive tests on teacher-provided materials:
    - a) Destructive and non-destructive testing for: electrical resistance, fatigue, toughness, hardness, compression, durability, stress, ductility, malleability, machinability, thermal characteristics, and moisture content.
    - b) Acid resistance of various materials.
    - c) Flame resistance of various materials.
    - d) Corrosion resistance of various materials.
    - e) Tensile strength of various materials.
    - f) Strength of fasteners of various types.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Make charts comparing materials regarding selected characteristics from Core Activity 2.
2. Perform selected tests on material(s) (as in Core Activity 3).
3. Using results of tests, select the best materials for the class product.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Grinder
Assorted Hammers
Magnet
Propane Torch Outfit
Vise
Arbor Press
Anvil
Pop Rivet Kit
Other Tools Testing Equipment Needed to Test Various Materials

MATERIALS/CORE:

Various Materials Needed to Perform Tests, eg. salt, water, woods, plastics, metals, leather, glass, fuels, chemicals, etc.

TOOLS AND EQUIPMENT/ADVANCED:

Same as Core

MATERIALS/ADVANCED:

Same as Core

APPLICATION OF TERMS:

Anvil
Describe
Research
Analyze
Electrical Resistance
Tensile Strength
Toughness
Compression
Stress
Malleability
Corrosion Resistance
Materials Chart
Softwood
Refractories
Alloys
Retrieve
Experiment
Destructive and Non-destructive Testing
Testing
Insulation
Fatigue
Hardness
Durability
Ductility
Machinability
Thermal
Hardwood
Ceramics
Chemicals
Polymers
Organic/Non-organic Materials
Inorganic
ASTM (American Society of Testing and Materials)

REFERENCES:

Fales, James,; Sheets, Everett; Mervich, Gregg; Dinan, John; Manufacturing: A Basic Text for Industrial Arts, Peoria, Illinois: Bennett and McKnight Publishing Company, Inc., 1986.

Wright, Thomas, Exploring Manufacturing, Bloomington, Ill.: Goodheart-Willcox Company, Inc., 1985.

REFERENCE: 1.9

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Product Engineering

MAJOR CONCEPT: Models, mock-ups and prototypes are used to show the final appearance and engineering characteristics of the product.

TOPICS:

1. Engineering Design for Function
2. Engineering Design for the Requirements of Manufacturing
3. Engineering Design for Fulfilling Consumer Wants or Needs
4. Models
5. Appearance Mock-ups
6. Prototypes
7. Engineering Tests (durability, operation, feasibility, and safety)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify engineering design factors to be considered in product engineering (function, manufacturing, feasibility, safety, cost, and selling appeal).
2. Research engineering considerations for selected products.
3. Analyze designs according to engineering requirements.
4. Construct a mock-up of a product design.
5. Identify changes/improvements to be made on the mock-up from activity four.
6. Produce working drawings that reflect the identified changes/improvements from activity four.
7. Construct a product prototype from the working drawings.
8. Explain why engineering testing is an important step in the product development process.
9. Identify the areas to be evaluated in the engineering testing phase of product design.
10. Perform engineering tests on product mock-up and prototype.

CORE INSTRUCTIONAL ACTIVITIES:

1. Work in groups to research designs and engineering requirements for different types of products that have been identified by the instructor/student.
2. Evaluate, as a group, the design and engineering factors for several products of the selected type and present the evaluations to the class.
3. Discuss the relationship of function to performance.
4. Construct a soft mock-up of a product.
5. Construct a model of a redesigned product.
6. Work in groups to make an appearance mock-up for the product that has been selected for the production unit.
7. Construct a prototype for the product that has been selected for the production unit.
8. From the original statement of the product's function generate a checklist for testing the prototype (ref. 1.6).

9. Devise testing techniques to evaluate the function of the product mock-up or prototype.
10. Test the product mock-up or prototype and either approve the design or send the product back with recommendations for change.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Build a rough model or mock-up for one of the product ideas and conduct a survey to recommend improvements that will satisfy both the consumer and the production requirements of the product.
2. Construct a model of the product in advanced activity number one.
3. Produce an appearance mock-up for the product selected for the production unit.
4. Produce a prototype for the product selected for the production unit.
5. Complete Core Activities 8-10.
6. Conduct final evaluation to determine the manufacturing feasibility for the product.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Special equipment needs will be determined by the nature of the product and the nature of the testing.

MATERIALS/CORE:

Special material needs will be determined by the nature of the product and the nature of the testing.

TOOLS AND EQUIPMENT/ADVANCED:

Same as Core

MATERIALS/ADVANCED:

Same as Core

APPLICATION OF TERMS:

Durability
Safety
Engineering
Product Life Expectancy
Mock-Up
Model
Operation
Feasibility
Checklist
Function
Prototype
Component Part

REFERENCES:

Groneman, C. H. and Grannis, G. C., Exploring the Industries, Albany, New York: Delmar Publishers, 1981.

Lindbeck, J. R. and Lathrop, I. T., General Industry and Technology, Encino, CA.: Glencoe Publishing Co., 1986.

Wright, R. T. and Henak, R. M., Exploring Production, South Holland, Illinois: Goodheart-Willcox, 1985.

Wright, R. T., Manufacturing, South Holland, Illinois: Goodheart-Willcox, 1976.

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REFERENCE: 2.1

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Establishing Accident Prevention Programs

MAJOR CONCEPT: Accident prevention is a responsibility of all management.

TOPICS:

1. Safety Engineering (i.e. equipment, environment, and facility)
2. Education/Safety Training/Attitude Development
3. Personal Protective Equipment
4. Encouragements (i.e. awards and reminders)
5. Enforcements (i.e. rules and discipline)
6. Basic First Aid/Emergency Procedures

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain why safety on the job is important to oneself and the company (economic, legal, moral, and personal reasons).
2. List and explain the five "E's" of a safety program (engineering, education, encouragement, enforcement, and enthusiasm).
3. Develop a safety program, poster, and safety checklist.
4. Demonstrate a positive attitude regarding safety (i.e. obedience to safety rules).
5. Suggest ways to prevent accidents in the school lab (equipment, behavior, rules, etc.).
6. Explain reasons for wearing personal protective equipment.
7. Participate in a safety meeting.
8. Identify and inspect critical areas of the laboratory.

CORE INSTRUCTIONAL ACTIVITIES:

1. Develop safety posters and slogans.
2. Discuss why safety in the school and on the job is important.
3. Develop and use an equipment safety checklist.
4. Develop a class corporation safety program that includes aspects of Topics 2-5.
5. Explain reasons for wearing safety equipment in class.
6. Conduct a safety meeting on a teacher assigned safety topic.
7. Conduct a laboratory safety inspection.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Develop a safety checklist to check safety at home.
2. Develop a safety manual to be used by the class.
3. Produce a slide show on safety in the Industrial Technology Lab.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Safety Equipment
- Pencils
- Markers

MATERIALS/CORE:

- Poster Paper

TOOLS AND EQUIPMENT/ADVANCED:

- Same as Core
- Camera

MATERIALS/ADVANCED:

- None

APPLICATION OF TERMS:

- Attitudes
- Machine Guards
- Persistence
- Safety Zone
- Combustibles
- OSHA- Occupational Safety Hazard Act
- Reliability
- Safety Hazard

REFERENCES:

Fales, James; Sheets, Everett; Mervich, Gregg; Dinan, John; *Manufacturing: A Basic Text for Industrial Arts*, Peoria, Illinois: Bennett and McKnight Publishing Company, Inc., 1986.

Hammer, Willie, *Occupational Safety and Health Engineering*, Englewood Cliffs, N.J.: Prentice-Hall, 1986.

REFERENCE: 2.2

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Hiring

MAJOR CONCEPT: The personnel department hires the best-qualified people for the available positions.

TOPICS:

1. Job Descriptions (D.O.T.)
2. Recruiting
3. Applications and Applying for a Job
4. Interviews
5. Selection
6. Hiring
7. Wages/Benefits

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Participate in a discussion in what an employment manager looks for in job applicants.
2. Identify manufacturing openings from classified ads.
3. Fill out a job application form.
4. Identify a job description from the D.O.T.
5. Discuss wages and benefits.
6. Apply for a job and role play the interview process.
7. Compute the annual wage from an hourly rate.

CORE INSTRUCTIONAL ACTIVITIES:

1. Participate in classroom discussions of personnel selection and recruiting.
2. Identify job openings from classified ads.
3. Use D.O.T. to identify qualifications for class corporation jobs.
4. Prepare brief job descriptions for the class corporation.
5. Fill out an industry supplied job application.
6. Role play applying for jobs and job interviews.
7. Assign hourly wages to corporation jobs and calculate yearly income of each job.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Create a job application form.
2. Prepare job descriptions and analyze jobs in terms of specific job duties, working conditions, and hiring requirements.
3. Develop brief training programs and train workers for identified jobs.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Classified Advertisements
Dictionary of Occupational Titles

MATERIALS/CORE:

Industry Supplied Job Applications

TOOLS AND EQUIPMENT/ADVANCED:

None

MATERIALS/ADVANCED:

None

APPLICATION OF TERMS:

- Advertise
- Interview
- Laid Off
- Personnel Department
- Qualifications
- Classified Ad
- Recruiting
- Wage
- Hourly Rate
- Application
- Fringe Benefits
- Management
- Pay Scale
- References
- Job Description
- D.O.T.-Directory of Occupational Titles
- Benefits

REFERENCES:

Fales, James; Sheets, Everett; Mervich, Gregg; Dinan, John; Manufacturing: A Basic Text for Industrial Arts, Peoria, Illinois: Bennett and McKnight Publishing Company, Inc., 1986.

REFERENCE: 2.3

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Training

MAJOR CONCEPT: After a person is hired, he/she participates in a training program dealing with the job he/she is expected to perform.

TOPICS:

1. On the Job Training (OJT) by Performing the Job Under Supervision
2. Classroom Training (in plant or other school)
3. Vestibule (in plant using actual equipment, but not in the production situation)
4. Safety Training

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Discuss types of training programs in manufacturing.
2. Determine the type of training needed for various jobs involved in the manufacturing of the class project.
3. Design a training program.
4. Successfully complete training for a production job.
5. Pass a safety exam with 90% proficiency.

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify various jobs (ads, parents, or community) and discuss the type of training needed for each job.
2. Identify the type of training program needed for each job in the class corporation.
3. Design a training program for each job in the class corporation.
4. Train class production workers.
    a) Teacher might train selected workers and these people, in turn, train the rest.
    b) Teacher trains all workers.
5. Take a safety test.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Identify training needs for the production jobs involved with producing the class product.
2. Develop a schedule and train workers for various production jobs involved in producing the class product.
3. Take a safety test.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

Newspaper (classified ads)

Safety Tests

TOOLS AND EQUIPMENT/ADVANCED:

Standard Classroom Equipment

MATERIALS/ADVANCED:

List of students and jobs they are to be trained for.

Safety Tests

APPLICATION OF TERMS:

On the Job Training
Vestibule
Production Job
Simulated Production
Classroom Training
Training Program
Job
Coaching

REFERENCES:

Fales, James; Sheets, Everett; Mervich, Gregg; Dinan, John; *Manufacturing: A Basic Text for Industrial Arts*, Peoria, Illinois: Bennett and McKnight Publishing Company, Inc., 1986.

REFERENCE: 2.4

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Organized Labor and Collective Bargaining

MAJOR CONCEPT: Unions collectively bargain for their members so that the individual does not have to negotiate with the company for better employee benefits.

TOPICS:

1. Purpose of Labor Unions
2. Procedures for Negotiation of a New Contract Between a Union and a Company
3. Duties of Union Officers
4. Elements of a Typical Contract

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain the purpose of labor unions and tell why a worker would or would not want to belong to one.
2. Explain the procedures for negotiation of a new contract between a union and a company.
3. Define contract and outline the elements in a typical contract.
4. Explain what is meant by collective bargaining, and list three factors that may be involved in bargaining (wages, hours, and working conditions).
5. Name two steps taken before striking in an attempt to solve a labor management problem (union proposal, company counterproposal, negotiation, mediation, and arbitration).

CORE INSTRUCTIONAL ACTIVITIES:

1. Given a collective bargaining situation, arrive at a solution by following the appropriate procedure (role play: one half class-labor, other half class-management).
2. Discuss reasons for and against joining a union.
3. Discuss reasons why labor management friction occurs and the steps to reaching a solution.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Read about the history of collective bargaining and make presentation to the class on what was found.
2. Given a labor management dispute, use collective bargaining procedures to solve the problem (role-playing).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:
Example of a union contract

TOOLS AND EQUIPMENT/ADVANCED:
None

MATERIALS/ADVANCED:
None

APPLICATION OF TERMS:

Arbitration
Authorization Cards
Certification
Collective Bargaining
Contract
Counterproposals
Negotiations
Proposals
Union
Locals
AFL-CIO
Wagner Act
Teamsters
Negotiate
Grievance
NLRB
Shop Steward

REFERENCES:

Wright, Thomas, Exploring Manufacturing, South Holland, Illinois: The Goodheart-Willcox Co., 1985.

REFERENCE: 3.1

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Extracting Raw Materials

MAJOR CONCEPT: Industries obtain raw materials for manufacturing from the land, water and air.

TOPICS:

1. Hydrocarbon Fuels (i.e. coal, gas, oil, and peat)
2. Raw Materials from the Air (i.e. oxygen, helium, hydrogen, nitrogen, neon, argon, etc.)
3. Raw Materials from the Sea (i.e. gold, salt, magnesium, water, oxygen, hydrogen, sodium, etc.)
4. Raw Materials from the Land (i.e. iron, lead, copper, zinc, gold, silver, platinum, coal, peat, oil, lime, emery, etc.)
5. Renewable Resources (i.e. trees, cotton, wool, flax, and hides)
6. Exhaustible Resources (i.e. metal ores, petroleum, natural gas, coal, and marble)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe ways hydrocarbons are obtained.
2. Describe ways ores are mined.
3. Describe ways raw materials are obtained from the air.
4. Describe ways raw materials are obtained from the land.
5. Describe ways raw materials are obtained from the water.
6. List raw materials available from South Carolina.
7. List raw materials available and not available in the United States.
8. Identify countries which supply particular raw materials to the United States.

CORE INSTRUCTIONAL ACTIVITIES:

1. Make a map and locate where raw materials may be located in South Carolina (emery, gold, titanium, sand, clay, rock, lime, etc.).
2. Make a map (or use a world map) and locate where raw materials may be found in the United States/World.
3. Separate sand and other aggregates (screening).
4. Separate brass or lead from sand by panning.
5. Mine clay and separate it from the debris.
6. Describe the way coal is mined (open pit, strip, and shaft mining).
7. Discuss methods of extracting oil.
8. Discuss the methods of obtaining raw products from the air (nitrogen, oxygen, helium, and the rare gases).
9. List renewable resources from the land (trees and other plants).
10. Discuss primary processes of obtaining raw materials (mining, forestry, farming, pumping, etc.).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Convert yellow pine to wood pulp and make paper.
2. Make peanut oil using a blender.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Dictionary
Maps
Plans (mines, oil drilling, forestry operations, etc.)
Encyclopedias
Globe of the World

MATERIALS/CORE:

Aggregates
Sand
Clay
Brass Filings
Iron Filings

TOOLS AND EQUIPMENT/ADVANCED:

Blender
Pressure Cooker
Screen Wire
Drying Rack
Hot Pressing Iron

MATERIALS/ADVANCED:

Wood Pulp
Bleach
Alkali
Peanuts
Iron Filings
Pencil
Sand
Aggregates
Brass Filings
Clay

APPLICATION OF TERMS:

Resources
Aggregates
Components
Extraction
Distribution
Harvesting
Shaft Mining
Hydrocarbons
Ores
Renewable Resources
Exhaustible Resources
Open Pit Mining
Strip Mining

REFERENCES:

Fales, James; Sheets, Everett; Mervich, Gregg; Dinan, John; Manufacturing: A Basic Text for Industrial Arts, Peoria, Illinois: Bennett and McKnight Publishing Company, Inc., 1986.

Wright, R. Thomas, Process of Manufacturing, South Holland, Illinois: The Goodheart-Willcox Company, Inc., 1987.

REFERENCE: 3.2

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Primary Processes of Making Basic Materials

MAJOR CONCEPT: Raw materials have to be refined or processed for use in industry.

TOPICS:

1. Refining Iron Ore
2. Processing Latex Rubber
3. Refining Oil
4. Processing Products from the Forest
5. Reducing Aluminum
6. Processing Seawater to Obtain Magnesium and Salt
7. Processing Air to Obtain Pure Gas Elements

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Discuss the basic process of making iron and steel.
2. Explain how latex rubber is produced.
3. Discuss how finished materials are obtained from petroleum (refining).
4. Discuss how products from the forest are processed.
5. Explain how aluminum is reduced.
6. Explain and discuss how products are obtained from seawater.
7. Explain two methods of obtaining pure oxygen (air reduction and electrolysis of water).

CORE INSTRUCTIONAL ACTIVITIES:

1. In groups of three or four students, make a chart illustrating one of the following:
   a) Latex rubber production
   b) Iron ore production
   c) Cracking petroleum
   d) Forestry operations
   e) Reducing of aluminum
   f) Processing seawater to obtain magnesium
   g) Obtaining pure oxygen by air reduction and by electrolysis
2. Separate the impurities from molten lead through skimming.
3. Evaporate salt from "sea water" (evaporation of concentrated salt solution).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Make a flow chart showing how steel is produced from pig iron.
2. Make a chart showing all the steps for making turpentine.
3. Comb and clean raw wool or cotton. Spin it into thread. Make a pot holder or similar size product from the thread.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Hot Plate or Other Heating Means (oxyacetylene or propane torch)
Steel Container
Metal Spoon
Scissors
Rulers

MATERIALS/CORE:

Poster Board
Salt
Pens
Water
Lead

TOOLS AND EQUIPMENT/ADVANCED:

Electric Stove
Steel Container
Metal Spoon
Scissors
Spinning Bobbins
Nail Frame Loom
Wire Cards
Ruler

MATERIALS/ADVANCED:

Turpentine
Raw Wool or Cotton
Pine
Solvents for Cleaning Fibers

APPLICATION OF TERMS:

Turpentine
Refining
Aluminum
Lead
Magnesium
Steel
Iron Ore
Latex Rubber
Sodium

REFERENCES:

Feirer, John L., General Metals, New York: McGraw-Hill, 1984.

Graham, Gregory S., Metalworking: an Introduction, Boston, Mass.: Breton Publishing, 1981.

Johnson, Harold V., Manufacturing Process, Encino, Ca.: Bennett Publishing Company, 1984.

Ludwig, Oswald A., et.al., Metalwork: Technology and Practice, Bloomington, Ill.: McKnight Publishing, 1985.

Wright, R. Thomas, Exploring Manufacturing, South Holland, Ill.: Goodheart-Willcox Company, Inc., 1985.

REFERENCE: 3.3

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Separating by Chip Removal

MAJOR CONCEPT: In chip removing, material is separated and removed in the form of shavings or chips.

TOPICS:

1. Turning and Threading
2. Sawing
3. Filing and Broaching
4. Milling and Related Operations
5. Drilling, Boring, Reaming, Tapping, Counter Drilling, Step Drilling, Counter Boring, Counter Sinking, Reaming, and Spotfacing
6. Abrasive Machining: Grinding, Sanding, Loose-Media and High-Finish Processes

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Perform a variety of chip-removing processes.
2. Identify materials on which chip-removing processes are used.
3. Identify chip removing processes as they apply to laboratory use.

CORE INSTRUCTIONAL ACTIVITIES:

1. Perform as many chip-removing practices as possible that are listed in the suggested topics.
2. Identify the chip-removing processes used in the school laboratory.
3. Identify materials on which chip-removal processes are used.
4. Identify and perform chip-removing processes as they apply to the class product or project.
5. Present a simple product using separation equipment.
6. Identify and describe the similarities in the tools, machines, and processes as used in the laboratory.
7. Name the three types of motion used in separating (rotating, reciprocating, and linear).
8. Use the Computer Numerical Control (CNC) mill or Computer Numerical Control (CNC) lathe to make a product.
9. Do practice drilling on different types of material.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design and manufacture a simple project using the CNC lath or CNC mill (metal, plastic, or wax).
2. Discuss the cutting materials used for cutting other materials:
    a) Carbon tool steel
    b) High speed steel
    c) Cast nonferrous alloys
    d) Diamond
    e) Carbides, tungsten, and alloys
    f) Sintered oxides and ceramics

3. Use machine cutting tools in the laboratory to cut out components for the class project.
4. Compare the cutting rate of different types of abrasives on standard materials.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer
CNC Lath
CNC Mill
Wood Working Lath
Metal Working Lath
Wood Working Hand Tools
Drill Bits
Table Saw
Power Hacksaw
Band Saw
Shaper
Grinder/Buffer
Sander
Metal Working Hand Tools
Abrasive Cutoff Machine
Drill Press

MATERIALS/CORE:

Wood
Metal
Sandpaper
Plastic

TOOLS AND EQUIPMENT/ADVANCED:

Abrasive Machinery and Finishing Tools
Computer
Drill Bits
Files
Wood Working Lath
Metal Working Lath
Wood Working Hand Tools
Metal Working Hand Tools
Table Saw
Drill Press
CNC Lath
CNC Mill
Sander
Grinder/Buffer
Planer
Shaper
Power Hacksaw
Band Saw

MATERIALS/ADVANCED:

Wood
Sandpaper
Abrasives
1. Silicon Carbide
2. Aluminum Oxides
3. Aluminum Oxide/Zirconium Oxide Cofusion
4. Sintered Bauxite
5. Cubic Boron Nitride (CBN)
6. Diamonds
7. Variety of Polishing Compounds

Metal
Plastic

APPLICATION OF TERMS:

Sawing
Drilling
Milling
Jointing
Broaching
Honing

- Planing
- Shaping
- Turning
- Filing
- Boring
- Tapping
- Threading
- Routing
- Abrading
- Reaming
- Tumbling
- Buffing
- Polishing
- Lapping
- Scraping
- Brushing
- Blasting
- Grinding
- Chopping
- Chiseling
- Crushing
- Vibrating

REFERENCES:

Linbeck, John R. and Lathrop, Irvin T., General Industry and Technology, Encino, CA: Bennett and McKnight, 1986.

Shackelford, Ray, Introduction to Separation Mf-P-013, Center of Implementing Technology Education, Department of Industry and Technology, Ball State University: Muncie, In. 47306,1987.

Shackelford, Ray, Abrasive Machining Mf-P-030, Center of Implementing Technology Education, Department of Industry and Technology, Ball State University: Muncie, In. 47306, 1987.

Wright, R. Thomas, Process of Manufacturing, South Holland, Ill.: Goodheart-Willcox Company, Inc., 1987.

Wright, R. Thomas, Manufacturing, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1984.

NOTES

REFERENCE: 3.4

MAJOR TITLE: Management and Production

UNIT TITLE: Shearing

MAJOR CONCEPT: Shearing separates materials without the formation of chips or the use of burning or melting.

TOPICS:

1. Shearing and Slitting
2. Blanking, Cutting, and Parting
3. Punching, Perforating, and Slotting
4. Notching and Lancing
5. Trimming and Shaving

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify and perform at least five basic shearing operations utilizing a variety of tools and techniques.
2. Identify and describe different shearing operations commonly used in the home.
3. Identify and describe shearing operations used in industry. Discuss these industrial applications and compare them to applications in the laboratory and at home.
4. Identify and use the shearing processes and the tools needed to perform shearing operations during the production of a class mass-production project.

CORE INSTRUCTIONAL ACTIVITIES:

1. Use the bench shear and squaring shear to cut out a minimum of two sheet metal blanks from different materials (copper blanks for name plates and aluminum blanks for bowls to be used in other units).
2. Perform at least five different shearing operations on a variety of different materials (paper, leather, wood plastic, styrofoam, and metal). Discuss the differences in the processes due to the materials and tools involved.
3. Shear a piece of copper tubing and a piece of PVC pipe using a rotary cutter.
4. Perform shearing operations necessary to the production of the class mass production project.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design and make a tool for notching computer disks.
2. Design a simple project which involves at least three different shearing operations. Construct the project. Analyze the potential for mass production.
3. Perform the shearing processes to be used in mass producing the class product.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Bench Shears
Squaring Shears
Sheet Metal Punch
Leather Punch
Sharp Knife
Paper Punch
Scissors
Tubing Cutter
Aviator or Tinner's Shears

MATERIALS/CORE:

Wood
Plastic
Sheet Aluminum
Sheet Copper
Styrofoam
Paper
Cardboard
Leather
PVC Pipe
Copper Tubing

TOOLS AND EQUIPMENT/ADVANCED:

Leather Punch
Heavy Duty Shears
Sheet Metal Punch
Aviator Shears
Equipment as needed for mass production activity

MATERIALS/ADVANCED:

Sheet Copper
Leather
Sheet Aluminum
Flat Steel
Other materials according to requirements of Activity 2

APPLICATION OF TERMS:

Shearing
Die Cutting
Lancing
Trimming
Shaving
Rotary Shearing
Scoring
Notching
Slitting
Blanking
Punching
Slotting
Perforate

REFERENCES:

Johnson, Harold V., Manufacturing Process, Encino, Ca.: Bennett Publishing Company, 1984.

Wright, R. Thomas, Exploring Manufacturing, South Holland, Ill.: Goodheart-Willcox Company, Inc., 1985.

REFERENCE: 3.5

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Separation by Other Processes

MAJOR CONCEPT: Processes other than shearing and chip removal can be used to separate materials.

TOPICS:

1. Electrical Discharge Machining (EDM)
*2. Electrochemical Machining (ECM)
3. Chemical Machining
*4. Laser Machining
*5. Electron Beam Machining
6. Flame Cutting
*7. Plasma Arc Cutting
8. Induced Fracturization
9. Screening
10. Flotation
11. Filtration
12. Magnetic Separation
13. Evaporation
14. Distillation
15. Centrifuging
16. Absorption
17. Sedimentation
18. Leaching
19. Friction Sawing
*20. Combing

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain and demonstrate methods to separate materials other than by shearing and chip removal.
2. Explain why these processes are not shearing and chip-removal processes.
3. Perform a minimum of two "other separating processes."

CORE INSTRUCTIONAL ACTIVITIES:

1. Cut a hole in thin brass using an electrical discharge machine.
2. Compare and contrast EDM with more traditional types of machining.
3. Separate oil from water using cotton (absorption).
4. Chemically machine a piece of aluminum.
5. Cut steel with an oxyacetylene torch (flame cutting).
6. Induce a fracture in glass or tile using a glass or tile cutter (fracturization).
7. Separate gravel from sand using screen wire (screening).
8. Separate common clay to be used in ceramics from the impurities (rocks, sand, and vegetable matter) by dissolving it in water (flotation, sedimentation) then screening.
9. Evaporate water from the clay to be used in ceramics.

10. Separate steel filings from brass and aluminum using a magnet (magnetic separation).
11. Separate aluminum filings from brass filings by using water (flotation by panning).
12. Distill dirty water; test and compare its purity with the original.
13. Separate honey from a corn cob by using a centrifuge.
14. Filter impurities from water contaminated with foreign matter.
15. Leach salt from soil in a container by pouring water through the mixture. Collect the liquid, evaporate it, and collect the salt.
16. Discuss the topics identified by the asterisk.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Construct an Electrical Discharge Machine (EDM).
2. Compare a common chip removal process with "other separating processes."
3. Build an electro-magnet for separating aluminum from iron.
4. Make a stained glass window.
5. Attach a laser trainer to an armoroid; trace a pattern on a piece of photographic film to demonstrate laser cutting.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Electric Discharge Machine
Oxyacetylene Torch
Still
Glass Cutter
Glass Container (for ECM)
Magnet
Centrifuge
Metal Bucket
Screen Wire

MATERIALS/CORE:

Photo Resist
Gravel & Sand
Clay
Steel Filings
Glass
Tile
Formica
Corn Cob
Acetylene Gas
Aluminum Filings
Brass Filings
Honey
Salt
Cotton
Acid Resist Paint
Murietic Acid

TOOLS AND EQUIPMENT/ADVANCED:

Armatron
Laser Trainer
Computer
Core for Magnet
Red Safe Light
Developing Trays
Metal Bucket

MATERIALS/ADVANCED:

Photographic Film
Developer
Fixer
Stop Bath
Copper Wire (28 gage)
Battery

APPLICATION OF TERMS:

- Computer
- Laser
- Armatron
- Battery
- Electrical Discharge Machine
- Electromagnet
- Electrochemical Machinery
- Electron Beam Machinery
- Flame Cutting
- Plasma Arc Cutting
- Leaching
- Sedimentation
- Absorption
- Centrifuge
- Distillation
- Evaporation
- Magnetic Separation
- Filteration
- Screening
- Fracturation

REFERENCES:

Linbeck, John R. and Lathrop, Irvin T., General Industry and Technology, Peoria, Ill.: Bennett and McKnight, 1986.

Wright, R. Thomas, Processes of Manufacturing, South Holland, Ill.: The Goodheart-Willcox Company, Inc., 1987.

NOTES

REFERENCE: 3.6

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Casting and Molding

MAJOR CONCEPT: Casting or molding is pouring or forcing a liquid or soft material into a cavity so that the material takes the shape of the cavity when it cools or sets.

TOPICS:

1. Metal Casting
2. Plastic Casting
3. Ceramics Casting
4. Glass Casting
5. Advantages and Disadvantages of Casting
6. Examples of Cast Products
7. Casting Machines and Equipment

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe at least four types of casting (green sand, dry sand mold, shell mold, full mold, investment mold, permanent mold, die, centrifugal, gravity, injection molding, compression molding, and dip).
2. Discuss how casting developed.
3. Discuss the advantages and disadvantages of casting and molding.
4. Name five kinds of expendable molds (green sand, dry sand, shell, investment, and plaster).
5. Name four kinds of permanent molds (die, centrifugal, plaster, and permanent iron).
6. Slip cast ceramics.
7. Make an investment casting.
8. Make a plastic injection molded product.

CORE INSTRUCTIONAL ACTIVITIES:

1. Slip cast ceramics.
2. Using expanded polystyrene, design, make a pattern, and pour a full sand mold casting.
3. Cast a project using green sand casting techniques.
4. Make candles using a permanent mold.
5. Make a permanent mold lead soldier.
6. Make a dip casting using plastic or latex materials (balloons, gloves, etc.).
7. Use the injection molding machine.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Make a pattern with allowances for shrinkage, machine finish, size, tolerances, and draft.
2. Cast the project in a green sand molding using the pattern made in Activity 1.
3. Remove and clean the item.
4. Design and make jewelry using the lost wax or investment technique.
5. Centrifugally cast jewelry.

6. Make and use a ceramic mold using plaster of Paris.
7. Slip cast ceramics using the mold made in Activity 6.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Ceramics Kiln
- Dip Casting Molds
- Green Sand Mold Patterns
- Green Sand Molding Equipment (eg. flasks and molding tools)
- Safety Clothing and Equipment
- Plastics Injection Molder
- Furnace/Kiln (gas or electric)
- Permanent Candle Mold

MATERIALS/CORE:

- Nylons and Epoxies for Compression Molding
- Expended Polystyrene for Full Molds
- Polyvinyl Chloride Resins for Dip Molding
- Wax Slip
- Plaster of Paris
- Molding Sand
- Scrap Metal
- Pop Bottles
- Paper
- Injection Plastic
- Green Sand
- Copper for Jewelry
- Propane Gas
- Pop Rivets
- Pencil

TOOLS AND EQUIPMENT/ADVANCED:

- Wood-Carving Tools
- Investment Mold Oven
- Permanent Candle Mold
- Furnace/Kiln (Gas, Electric, Induction)
- Safety Clothing and Equipment
- Green Sand Molding Equipment (e.g. flasks and molding tools)
- Grinder with Wire Brush and Grinding Stone
- Centrifuge Casting Machine
- Dip Casting Molds

MATERIALS/ADVANCED:

- Scrap Metal
- Wax
- Plaster of Paris
- Copper for Jewelry
- Expended Polystyrene for Full Molds
- Propane Gas
- Slip
- Green Sand
- Latex for Dip Molding

APPLICATION OF TERMS:

- Green Sand Casting
- Dry Sand Casting
- Shell Mold Casting
- Full Mold Casting
- Investment Casting
- Plaster Mold Casting
- Permanent Mold Casting
- Slush Casting
- Die Casting
- Centrifugal Casting

REFERENCES:

Johnson, Harold V., Manufacturing Process, Encino, Ca.: Bennett Publishing Company, 1984.

Lindbeck, John P. and Lathrop, Irvin T., General Industry and Technology, Peoria, Il.: Bennett and McKnight, 1986.

Wright, R. Thomas, Manufacturing, South Holland, Il.: The Goodheart-Willcox Company, Inc., 1984.

Wright, R. Thomas, Processes of Manufacturing, South Holland, Il.: Goodheart-Willcox Company Inc., 1987.

NOTES

REFERENCE: 3.7

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Forming

MAJOR CONCEPT: All forming processes have in common the deformation of a material to force it into a new shape without reducing its weight.

TOPICS:

1. Hot and Cold Rolling
2. Compressing
3. Bending
4. Forging
5. Stretching
6. Drawing
7. Extruding
8. Hammering/Peening
9. Pressing
10. Stamping
11. Spinning
12. Vacuum Forming
13. Combing
14. Knitting
15. Weaving
16. Crystallizing
17. Conditioning

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify the two major categories of forming (cold forming and hot forming).
2. Identify eight forming processes (i.e. hammering, compressing, bending, stamping, combing, spinning, crystallizing, and stretching).
3. Identify four tools or machines which are used in the forming processes (i.e. hammer, stamps and dies, bar folder, and comb).
4. Demonstrate a variety of forming processes using the equipment available in the laboratory.
5. Identify forming processes used in the production of a class mass production project. Discuss and evaluate the processes.

CORE INSTRUCTIONAL ACTIVITIES:

1. Hammer an aluminum bowl to illustrate drop forging (See Reference 3.4).
2. Make a name plate from a copper blank using die stamps (See Reference 3.4).
3. Stretch a glass rod by applying heat and pressure. Experiment with bending and shaping the rod during the stretching process (wear safety glasses and gloves).
4. Make rock candy from a sugar water solution to demonstrate crystallization.
5. Compress sawdust and glue into a small fire log.
6. Make a corner bracket by bending a piece of sheet metal with a bar folder.
7. Comb cotton or wool and process the combed material into thread by spinning.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design and make a die for use on the arbor press.

2. Make a plastic salad bowl using a mated die.
3. Experiment with brass or iron filings and plastic resin to illustrate the powder metallurgy process.
4. Identify the forming tools used in the laboratory and discuss the nature of the shapes that result from using the tools. Identify the processes and discuss the desired outcomes.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Die Stamps
Arbor Press
Propane Torch with Gas Cylinder
Wood or Metal Molds (e.g. 3" pipe)
File Cards
Ball Peen Hammers
Bar Folder

MATERIALS/CORE:

Sheet Aluminum
Copper Blanks
Glass Rods
Sawdust and Glue
Sheet Metal
Cotton or Wool
Sugar
Water

TOOLS AND EQUIPMENT/ADVANCED:

Arbor Press
CNC Milling Machine (lathe)
Forming Tools (General Laboratory Tools)
Mated Die

MATERIALS/ADVANCED:

Assortment of Pipes (molds for powder metallurgy)
Blanks for Die (CNC)
Brass or Iron Filings
Wood or Metals for Dies
Plastic Sheet

APPLICATION OF TERMS:

Forming
Slip Casting
Bending
Extrusion
Thermoforming
Piercing
Metallurgy
Pressing
Spinning
Forging
Centrifugal Casting
Squeezing
Peening
Blow Molding
Drawing
Powder Metallurgy

REFERENCES:

Johnson, Harold V., Manufacturing Process, Encino, Ca.: Bennett Publishing Company, 1984.

Lindbeck, John P. and Lathrop, Irvin T., General Industry and Technology, Peoria, Il.: Bennett and McKnight, 1986.

Wright, R. Thomas, Processes of Manufacturing, South Holland, Il.: Goodheart-Willcox Company Inc., 1987.

NOTES

REFERENCE: 3.8

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Conditioning

MAJOR CONCEPT: Conditioning processes alter the structure of materials to improve mechanical and physical properties. The shape of the material is altered little or not at all.

TOPICS:

1. Thermal: Annealing, Normalizing, Hardening, Tempering, Drying, and Firing
2. Mechanical: Shot Peening and Tumbling
3. Chemical Processes: Catalysts
4. Magnetizing: Electromagnetic

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe six properties involved in the conditioning process (strength, elasticity, ductility, toughness, hardness, and moisture content).
2. Define four types of material strengths (tensile, compression, shear, and torsion).
3. Describe four conditioning processes.
4. Perform two conditioning processes.
5. Perform one experiment with a material before and after conditioning.

CORE INSTRUCTIONAL ACTIVITIES:

1. Kiln dry green lumber and discuss why wood is dried.
2. Fire a ceramic product in a kiln.
3. Design and forge a chisel, then harden and temper it using the proper techniques.
4. Embed small objects in clear cast resin to make a paperweight.
5. Compare soft copper with copper work hardened by peening. Then anneal the copper. (Can experiment with "stiffness" using a spring scale and copper strips.)
6. Magnetize a screwdriver using an electromagnet. Cast plastic to the handle (chemical conditioning).
7. Roll and bake clay or cookie dough (demonstrates thermal conditioning).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Use ball bearings or abrasives to mechanically condition a piece of copper using a sand/shot blasting machine or gem tumbler. Test/compare hardness with a file or punch struck with a standard force.
2. Pack carburize a piece of steel and test for increased hardness using a file.
3. Test ductility of thermoplastics at varying temperatures.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Kiln for Lumber
Kiln for Ceramics
Anvil
Personal Safety Equipment
Molds for Clear Cast
File to Test Hardness
Tongs
Forging Hammer
Ceramic Molds

MATERIALS/CORE:

Classroom Materials
Slip
Materials to be conditioned (i.e. plastic, wood, glass, metal, cookie dough)
Clear Cast w/Catalyst
Carbonizing Material
Paint
Varnish

TOOLS AND EQUIPMENT/ADVANCED:

Metal Files
Sand Blast Machine
Anvil
Gem Tumbler

MATERIALS/ADVANCED:

Thermoplastic
Standard Laboratory Equipment
Electromagnet
Pack Carbonizing Powder or Case Hardening Powder
Ball Bearings

APPLICATION OF TERMS:

Annealing
Hardening
Drying
Tensile Strength
Shear Strength
Elasticity
Toughness
Moisture
Kiln
Surface Hardening
Normalizing
Tempering
Firing
Compressive Strength
Torsion Strength
Ductility
Hardness
Content
Charcoal
Carbon

REFERENCES:

Shackelford, Ray, Testing Ductility of Thermoplastics, Center for Implementing Technology Education, Department of Industry and Technology, Ball State University, Muncie, Indiana, 47306.

Wright, R. Thomas, Processes of Manufacturing, South Holland, Ill.: Goodheart-Willcox Company, Inc., 1987.

REFERENCE: 3.9

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Combining (by Bonding, Adhesion, Cohesion, Fusion, Mixing, Blending, and Mechanical Methods)

MAJOR CONCEPT: Most products are assembled from several mated parts or components.

TOPICS:

1. Mechanical Assembly (i.e. Screw, Bolt, Rivet, Staple, Nail, Pin, Clip, Joint, and Seam)
2. Bonding Processes (Adhesives)
   a) Household - Glues
   b) Industrial - Thermoplastic Adhesives, Thermosetting Adhesives, and Elastomers
3. Heating and Pressure (Cohesion)
   Forge, Roll, Resistance, Induction, Energy Beam, and Friction Welding
4. Fusion
   Gas Welding, Arc Welding, Shielded Metal Arc Welding, Gas Metal Arc Welding, Submerged Arc Welding, Plasma Arc Welding, Thermit Welding, Laser Welding, and Ultrasonic Welding

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe the mechanical assembly methods of stitching, retaining ring and clip, pin, nail, rivet, threaded fastener, and metal seam.
2. Discuss applications of six common wood joints (T-joint, corner joint, butt joint, lap joint, skarf joint, and mortise and tenon).
3. Explain the fusion welding processes of gas welding, metallic arc welding, gas metal arc welding MIG, submerged arc welding, gas tungsten arc welding, plasma arc welding, stud welding, thermit welding, electron beam welding, ultrasonic welding, and laser welding.
4. Explain pressure welding processes (cold welding and explosive welding).
5. Explain heat and pressure welding (forge welding, spot welding, projection welding, seam welding, flash and upset welding, induction welding, friction welding, and diffusion bonding).
6. Explain adhesive bonding (thermoplastic adhesives, thermosetting plastics, and elastomers).
7. Explain brazing, soldering, torch brazing, induction brazing, furnace brazing, resistance brazing, braze welding, and solvent assembly.
8. Perform combining operations selected from Activities 1-7.

CORE INSTRUCTIONAL ACTIVITIES:

1. Make and bond together one or more common wood joints using glue and nails (group of students, one joint per group).
2. Weld together two pieces of metal using oxyacetylene or arc welding.
3. List and describe the stresses acting upon adhesives (tensile, shear, cleavage, peel, torsion, compression).

4. Solder or braze two pieces of metal.
5. Combine dissimilar metal using adhesive bonding.
6. Design, manufacture, and bond a wood cutting board.
7. Design and manufacture a clipboard and pop rivet the spring clip.
8. Combine two pieces of metal with rivets.
9. Flock the bottom of a surface.
10. Glue formica to another surface.
11. Sweat solder copper pipe fitting.
12. Pressure bond soap or clay.
13. Solvent bond plexiglass.
14. Discuss the degree of permanence of various fasteners.
15. Using activity boards, experiment with various types of mechanical fasteners (e.g. ease of use, permanence, strength, and appearance).
16. Tie-dye a tee shirt or other fabric.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Use the arc welder to make a demonstration of the common welding joints and mount them on a display board using mechanical fasteners.
2. Test the strength of the common methods of joining woods (nail, nail and glue, screws, glue, dowels and glue). See references.
3. Mix and blend concrete and cast into patio blocks.
4. Demonstrate pressure welding using clay or heated plastics using the arbor press.
5. Forge weld two pieces of mild steel.
6. Make various sheet metal seams (e.g. lock, flat lock, S-clip, Pittsburg, etc.).
7. Silver solder or braze dissimilar metals.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Standard Laboratory Tools and Equipment
Arbor Press
Anvil
Soldering Iron
Propane Torch
Oxacetylene Torch
Arc Welder
Mig Welder
Safety Equipment

MATERIALS/CORE:

Materials Dependent on Activities Selected

TOOLS AND EQUIPMENT/ADVANCED:

Standard Laboratory Tools and Equipment
Oxyacetylene
Arbor Press
Patio Block Mold
Forging Hammers
Spot Welder
Mig Welder
Anvil
Borax Flux

MATERIALS/ADVANCED:

Materials Dependent on Activities Selected

APPLICATION OF TERMS:

- T-joints
- Corner Joint
- Butt Joint
- Lap Joint
- Skarf Joint
- Dado
- Tongue
- Rabbet
- Dado Rabbet
- Miter
- Lock Miter
- Lock
- Oxyacetylene
- Tensile
- Shear
- Cleavage
- Peel
- Torsion
- Compression
- Shielded Arc Welding
- Thermosetting Plastic
- Resistance
- Laminating
- Diffusion
- Friction
- Induction
- Forge
- Thermal
- Ultrasonic
- Laser
- Electron
- Plasma Arc
- Thermit Welding
- Plasma Arc Welding
- Gas Tungsten Arc Welding
- Shielded Metal Arc Welding
- Electroslag Welding
- Submerged Arc Welding
- Gas Metal Arc Welding
- Flux Cored Arc Welding
- Eastomers
- Thermoplastic Adhesives

REFERENCES:

Althouse, Andrew D., et.al., Modern Welding, South Holland, Ill.: Goodheart-Willcox, Inc., 1986.

Lindbeck, John P. and Lathrop, Irvin T., General Industry and Technology, Encino, Calif.: Bennett and McKnight, 1986.

Shackelford, Ray, Center for Implementing Technology Education, Muncie, In.: (CITE), Mf-M-008 Comparing Mechanical Fastener in Wood, Department of Industry and Technology, Ball State University, 47306, 1986.

Shackelford, Ray, MF-M-004, Natural Polymer (Wood) Cleavage Test, Center of Implementing Technology Education, Department of Industry and Technology, Ball State University: Muncie, IN 47306.

Smith, Dave, Welding Skills and Technology, New York City, N.Y.: McGraw-Hill Book Company, 1984.

Wright, R. Thomas, Process of Manufacturing, South Holland, Ill.: Goodheart-Willcox Company, Inc., 1987."

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REFERENCE: 3.10

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Coating

MAJOR CONCEPT: Coating processes alter or treat the surface of products to protect them from the environment and improve appearance.

TOPICS:

1. Inorganic Coating (Chromium Plated Metal, Anodized Aluminum, Oxide Coated Steel, and Galvanized Iron or Steel, Lead Based Coverings)
2. Organic (Paints, Plastic Coverings, Types of Solvents, Methods of Film Formation, and Types of Binders)
3. Methods Used to Prepare Materials for Coating (Alkaline Cleaning, Water Rinsing, Mechanical Preparation)
4. Steps in Various Finishing Processes
5. Porcelain Enameling Processes
6. Coating Processes (i.e. Brushing, Printing, Spraying, Dipping, etc.)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Perform coating operations using necessary steps in finishing.
2. Use inorganic coating materials.
3. Use common organic coating materials.

CORE INSTRUCTIONAL ACTIVITIES:

1. Glaze a ceramic piece.
2. Porcelain enamel a copper object.
3. Electroplate using chromatic coating.
4. Prepare materials for finishing by mechanical, chemical and electrochemical methods.
5. Abrasive clean iron or steel (sanding, polishing, and buffing).
6. Burnish metal or plastic.
7. Chemically clean materials (pickling, alkaline, and ultrasonic cleaning).
8. Steam clean materials.
9. Vapor degrease oil metal.
10. Flame clean (oxyacetylene).
11. Use organic coating to finish a product using one of the following:
    a) Brush coating
    b) Roll coating
    c) Dip coating
    d) Flow coating
    e) Curtain coating
    f) Spray coating
    g) Electrocoating
    h) Printing
    i) Power coating
    j) Heat transfer coating
12. Wax and buff a material or product.
13. Compete with classmates to see who can best clean, prepare, and coat a piece of metal. (Teacher to provide rusted sheet metal blanks.)

14. Spray, brush, and dip a material and compare the result.
15. Screen print a logo on different materials.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Anodize or electroplate an aluminum product (jewelry, picture, old spoon, or chisel made in prior activity).
2. Photo Anodize using different colored dyes on various types of materials.
3. Use photo anodizing to make a nameplate.
4. Other activities can be selected from core.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Electroplating Equipment
Disk Sander
Polishing Wheel
Wire Brushes
Steam Cleaner
Paint Sprayer
Offset Press
Oxyacetylene Torch
Belt Sander
Buffing Wheel
Burnishing Tools
Ultrasonic Cleaner
Oxyacetylene Torch
Paint Brushes
Silk Screen
Porcelain Enameling Equipment

MATERIALS/CORE:

Electrolyte Solution
Polishing Compound
Oxygen
Paint
Solvent
Enameling Material
Silk Screen Ink Solvent
Electroplate Material
Acid
Acetylene
Ink
Wax
Silk Screen Ink
Ceramic Glaze

TOOLS AND EQUIPMENT/ADVANCED:

Process Camera
Vacuum Frame
Also: See Core Tools/Equipment
Anodizing Tanks
Film Developing Tanks

MATERIALS/ADVANCED:

Film
Fixer
Anodizing Solutions
Also: See Core Materials
Developer
Stop Bath
Anodizing Dyes

APPLICATION OF TERMS:

Glaze
Sanding
Buffing
Brushing
Alkaline
Electropolishing
Polymerzation
Polishing
Burnishing
Pickling
Ultrasonic
Anodizing

- Electrode
- Metalizing Wire
- Stirring
- Shaking
- Screen Printing
- Printing
- Plating
- Flocking
- Diffusion Coating
- Vacuum
- Blending
- Pouring
- Dyeing
- Dipping
- Toweling

REFERENCES:

Lindbeck, John P. and Lathrop, Irvin T., General Industry and Technology, Encino, Calif.: Bennett and McKnight, 1986.

Wright, R. T., Processes of Manufacturing, South Holland, Ill: Goodheart-Willcox, 1987.

Wright, R. T., Manufacturing, South Holland, Ill.: Goodheart-Willcox, 1984.

NOTES

REFERENCE: 3.11

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Production Management

MAJOR CONCEPT: Six areas of concern for the production manager are: input, storage and production, quality, personnel, materials handling, and overall economy.

TOPICS:

1. Obtaining Inputs - (equipment, finances, materials, personnel, energy, and knowledge)
2. Storage and Production - (receive and store raw materials, produce product, and store or ship finished product)
3. Quality - (acceptable quality product produced with minimum waste)
4. Personnel - (meet at least the minimum job demands for operating equipment to produce the product. Knowledge, skills, and work attitudes)
5. Materials Handling - (the ability to efficiently handle materials from raw materials to delivered products by utilizing conveyors, cranes, robots, computers, and other technological methods)
6. Overall Economy - (the methods used will produce the greatest profit at the lowest cost)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify six production considerations in manufacturing the class product.
2. Determine the storage capacity needed for the class product.
3. Select the most effective methods needed to manufacture the class product.

CORE INSTRUCTIONAL ACTIVITIES:

1. Determine the most effective methods needed to manufacture the class product.
2. Develop a production monitoring system to be used with the class product.
3. Using the parts list from the class product and the dimensions of your laboratory, calculate the needed space to store materials and finished products.
4. Identify and calculate overhead costs of producing the product.
5. Develop a flow chart that will show the production process of the class product.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design and build a conveyor system to handle raw materials and finished products.
2. Using the list of parts from the class product, determine which parts should be produced in plant and which parts should be purchased.
3. Do a "Break even" chart on the class product based on fixed overhead, variable materials and labor costs.

4. Do "Time & Motion" studies on various activities required to produce the class product and determine the wage cost per unit, given a specified wage per hour.
5. Perform Core Activities 1, 2, 3, and 5 for the class project.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Classroom/Laboratory Equipment
Stop Watches
Calculators/Computers
Etc.

MATERIALS/CORE:

Classroom Materials and Supplies
Time Motion Charts for Examples to be Given to Students

TOOLS AND EQUIPMENT/ADVANCED:

Same as Core
Conveyor Parts, i.e. rollers, belts, gears, etc., depending on system design

MATERIALS/ADVANCED:

Same as Core
Belting Material for Conveyor, Rollers, Belts, Etc.

APPLICATION OF TERMS

Energy
Quality
Availability
Computers
Flow Chart
Production Capacity
Role Play
Robots
Materials Requirement Planning
Allowance Time
Debugging
Jigs
Lead Time
Total Cost
Standardization of Parts
Operations Sheets
Hoists
Rollers
Parts List
Product Analysis

Input
Materials Handing
Conveyors
Master Production Schedule
Raw Materials
Personnel
Components
Automation
Cost Estimator
Fixed Cost
Labor Cost
Retooling
Efficiency
Designer
Production Controls
Pulleys
Delays
Plant Layout
Work Stations

REFERENCES:

Fales, James et.al., Manufacturing: A Basic Text, Encino, Calif.: Glencoe Publishing Company, 1986.

Wright, R. Thomas, Processes of Manufacturing, South Holland, Ill.: Goodheart-Willcox Company, Inc., 1987.

Wright, Thomas, Break Even Analysis, Muncie, In., 47306, Center for Implementing Technology Education, Ball State University, 1986.

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REFERENCE: 3.12

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Tooling Up for Production

MAJOR CONCEPT: Tooling up involves getting the tools and equipment at the proper plant location and ready for production.

TOPICS:

1. Designing and ordering any machines, tools, and equipment which must be specially made (i.e. jigs and fixtures).
2. Supervising the installation of machines and equipment, start-up, and trial run of product.
3. Placing tools and equipment for most efficient and safe production.
4. Getting the tools ready for production.

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Design and construct a jig, fixture, mold, or die to be used in the manufacturing of the class product.
2. Set up the production processes for the class product.
3. Prepare all machines and equipment for production.
4. Conduct a trial production run.
5. Discuss production system problems and make corrections.

CORE INSTRUCTIONAL ACTIVITIES:

1. Fill out an order/requisition form for necessary machines, equipment, and tools.
2. Design and construct jigs, fixtures, molds, and dies to be used in the manufacture of the class product.
3. Set up laboratory for trial production run.
4. Make trial production run of class product.
5. Monitor, report, and correct production problems.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Plan the layout of the manufacturing laboratory for a production run utilizing computers, conveyors, robots, and other automation techniques.
2. Critique the production process and suggest any changes to economize production.
3. Do a trial production run to check out the jigs and fixtures and other production processes. (Could be same as Core).
4. Monitor, report, and correct production problems.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Standard Laboratory Equipment
Special Items Needed Depending on Class Product

MATERIALS/CORE:

Classroom Materials (e.g. pen, pencil, catalogs from various educational suppliers, purchase order blanks, poster board)
Materials Depending on the Class Product Selected

TOOLS AND EQUIPMENT/ADVANCED:

Same as Core

MATERIALS/ADVANCED:

Same as Core

APPLICATION OF TERMS:

Fixtures
Mold
Jog
Layout
Critique

Punch and Die
Tooling Up
Debugging
Utilizing
Economize

REFERENCE:

Fales, James; Sheets, Everett; Mervich, Gregg; Dinan, John, Manufacturing: A Basic Text, Ventura, CA: Glencoe Publishing Company, 1986.

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REFERENCE: 3.13

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Inventory Control

MAJOR CONCEPT: Inventory control involves keeping track of all the materials that are needed for production as well as the components and completed units manufactured.

TOPICS:

1. Definition and purpose of Inventory Control
2. Areas of Inventory Control (i.e. raw materials, purchased parts, work in progress, and finished goods)
3. Devices used in Inventory Control (i.e. codes, computers, automated storage and retrieval)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define inventory control.
2. Discuss why inventory control is important to manufacturing.
3. Identify the four stages of inventory control. (See suggested topics)
4. Discuss and compare how traditional methods and new technologies are used in inventory control.
5. Devise an inventory control system for class product.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the functional importance of inventory records.
2. Use a flow chart to show where raw materials, work in progress, and purchased parts enter the manufacturing process. Identify points where inventory should be taken.
3. Develop an inventory control system.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Draw a manufacturing floor plan and show the materials routing plan for the class product.
2. Research and compare the advantages of new technology in inventory control over standard methods.
3. Create a computerized inventory control system to account for all components and completed pieces of the class product.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Standard Classroom Tools and Equipment
Computer

MATERIALS/CORE:

Standard Classroom Materials
Examples of Flow Charts, Floor Plans, etc.

TOOLS AND EQUIPMENT/ADVANCED:
Same as Core

MATERIALS/ADVANCED:
Same as Core

APPLICATION OF TERMS:

- Inventory
- Work in Progress
- Purchased Parts
- Automated Storage and Retrieval
- Storage
- Just In Time Purchasing and Delivery
- Raw Materials
- Finished Goods
- Unit Cost

REFERENCE:
Fales, James; Sheets, Everett; Mervich, Gregg; Dinan, John; Manufacturing: A Basic Text, Ventura, CA: Glencoe Publishing Company, 1986.

REFERENCE: 3.14

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Quality Control

MAJOR CONCEPT: Quality control is done to help production and to be sure that the product is good enough to be sold.

TOPICS:

1. Quality Control Defined
2. Purpose of Quality Control (Incoming Materials, Work In Progress, and Finished Goods)
3. Stages of Inspection of Quality Control
4. Quality Control Devices

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define quality control.
2. Explain why a company should be concerned with quality control.
3. List and express the importance of each four stages of inspection for quality control (incoming raw materials, component manufacture, assembly, and final inspection).
4. Demonstrate how to use selected quality control devices, jigs, fixtures, gauges, etc.
5. Discuss why maintenance policies, procedures, and records are important to quality control.
6. Make a quality control device.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the role and stages of product quality control.
2. Make various measuring devices to check the tolerances of parts from the class product.
3. Identify each step in the class production process where inspection must be done.
4. Locate positions/stations for the quality control inspections of class product/parts on a flow chart or shop layout.
5. Identify and train inspectors needed for assuring quality in the class product.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Perform the five core activities.
2. Design and make all quality control devices for the production line.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Stop Watches	Go-No-Go Gauges
Scales	Micrometer

Laboratory Equipment (i.e. lasers, computers, etc., if available)
Plus other tools as needed according to devices made

MATERIALS/CORE:

Time Charts	Flow Charts
Magazines	

Special Materials for Measuring Devices as per Class Product

TOOLS AND EQUIPMENT/ADVANCED:

Same as Core

MATERIALS/ADVANCED:

Same as Core

APPLICATION OF TERMS:

Quality Control	Acceptance Quality Control
Process Quality Control	In-Process Inspection
Final Inspection	Sampling
Stop Blocks (Go-No-Go Gauges)	

REFERENCES:

Fales, James et.al., Manufacturing: A Basic Text, Encino, Calif.: Glencoe Publishing Company, 1986.

Wright, R. Thomas, Processes of Manufacturing, South Holland, Ill.: Goodheart-Willcox Company, Inc., 1987.

REFERENCE: 3.15

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Producing the Product

MAJOR CONCEPT: Efficient manufacturing production is a result of careful management planning, organizing, and controlling.

TOPICS:

1. Final Check-out of Production System
2. Mass Production

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Conduct a final check-out of the production system.
2. Mass produce and store the products for subsequent packaging.

CORE INSTRUCTIONAL ACTIVITIES:

1. Analyze the production system to make sure all elements are functioning properly and ready for mass production.
2. Start-up and mass produce the class product.
3. Store finished class product for packaging.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Same as Core

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

All tools and equipment that have been identified to produce the class product.

MATERIALS/CORE:

All materials and supplies necessary to produce the class product.

TOOLS AND EQUIPMENT/ADVANCED:

Same as Core

MATERIALS/ADVANCED:

Same as Core

APPLICATION OF TERMS:

Start-up
Packaging
Mass Produce
Final Check-out

REFERENCE:

Fales, James et.al., Manufacturing: A Basic Text, Encino, Calif.: Glencoe Publishing Company, 1986.

REFERENCE: 3.16

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Packaging

MAJOR CONCEPT: Most manufactured products are packaged to protect them, make them easy to distribute, and promote them.

TOPICS:

1. Functions of a Good Package
2. Steps in Designing a Package
3. Types of Package Materials
4. Considerations in Selecting a Package
5. Design Considerations in Package Graphics
6. Service Manuals

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List the functions of a good package.
2. Design and build a package and package the product.
3. Describe four types of plastic packages (i.e. shrink, bags, skin, and blister).
4. Discuss three important considerations in package design (i.e. product identity, package graphics, customer appeal, and ease of use).
5. List types of packaging materials and material forms (i.e. plastic, cardboard, pallet, boxes, bags, etc.).
6. Identify reasons for packaging the product (i.e. protection, storing and shipping, holding and containing, identification and display, advertising, and ease of using product).
7. Provide a service manual that describes how to maintain and repair a manufactured product.

CORE INSTRUCTIONAL ACTIVITIES:

1. Analyze packages provided by the teacher to determine how well they protect the product, promote the product, and provide useful information for the consumer.
2. Provide graphics for the outside of a package.
3. Develop a service manual that describes how to maintain and repair a manufactured product. (If the class has manufactured a product, that product should be used in this activity.)
4. Set up a production/assembly line, make the package, and package/label the class product.
5. Identify important considerations in packaging design (eg. product identity (trademark, brand name), package graphics (colors go with product, all required information included), customers acceptance (pleasing, meets customers' need).)
6. Describe and explain the uses of plastic packaging including shrink, bags, skin, and blister methods.
7. Identify reasons for packaging a product (i.e. protection, storing and shipping, holding and containing, identification and display, and advertising).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Set up a classroom display of as many types of packages as possible.
2. Design and make a package using thermoforming plastics.
3. Package class product (See Core Activities).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Art Supplies (scissors, utility knife, markers, etc.)
Heat Gun
Plastic Cutter
Hot Glue Gun
X-Acto Knife
Oven
Hair Dryer
Hot Wire Styrofoam Cutter

MATERIALS/CORE:

Art Materials (paper, glue, etc.)
Plastic
Cardboard
Tape
Plastic Shrink Wrap
Styrofoam
Mailing Tape

TOOLS AND EQUIPMENT/ADVANCED:

Plastics Thermoforming Machine
See "Core" Tools

MATERIALS/ADVANCED:

Same as Core

APPLICATION OF TERMS:

Package
Thermoform
Scored
Blister Pack
Packaging
Cardboard
Shrink Packaging
Skin Pack

REFERENCES:

Wright, Thomas, Exploring Manufacturing, South Holland, Ill.: Goodheart-Willcox Co., 1985.

REFERENCE: 4.1

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Maintaining and Servicing Products

MAJOR CONCEPT: Servicing (post processing) is done on manufactured products to keep them functioning, to make them last longer, and to maintain their value.

TOPICS:

1. Difference Between Repair and Maintenance
2. The Steps in a Product Use Cycle (install, maintain repair, alter, or replace)
3. The Steps Used to Repair Products (Diagnose and Correct)
4. Economics of Replacement Versus Repair
5. Servicing by Manufacturer, Special Service Firms, or the Customer

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain the difference between repair and maintenance of products.
2. Describe the steps in a product use cycle.
3. List servicing groups (manufacturers, special service firms, and customers).
4. Explain the economics of replacement versus repair.
5. State the training/skills needed by specified service personnel.
6. Identify products in the home that require periodic service.
7. Service a piece of laboratory equipment or other equipment, (i.e. lubrication).

CORE INSTRUCTIONAL ACTIVITIES:

1. Prepare a service schedule for the class project.
2. Discuss the difference between maintenance and repair.
3. Perform service or maintenance on a product provided by the teacher (bike, lawn mower, laboratory equipment, etc.).
4. Discuss service occupations and careers.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design a training program for servicing a teacher-assigned product (bike, lawn mower, etc.).
2. Make a list of manufactured products in the home that may need to be serviced.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Standard Classroom Equipment

MATERIALS/CORE:

Dependent upon teacher assignment

TOOLS AND EQUIPMENT/ADVANCED:

As assigned by teacher

MATERIALS/ADVANCED:

Same as Core

APPLICATION OF TERMS:

- Diagnosing
- Install
- Maintain
- Maintenance
- Recycle
- Repair
- Salvage

REFERENCES:

Wright, Thomas, Exploring Manufacturing, South Holland, Ill.: Goodheart-Willcox Co., 1985.

REFERENCE: 4.2

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Marketing and Distribution

MAJOR CONCEPT: Products must be promoted and distributed to the buyer in order to return a profit.

TOPICS:

1. Types and Functions of Advertisement
2. Steps of Creating and Advertisement (Develop the Message, Design Presentation, and Produce the Advertisement)
3. Channels of Distribution
4. Coordinating Distribution
5. Wholesalers, Retailers, Direct Delivery

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify two types of advertisements (promoting a product or promoting an idea).
2. Explain the function of a good advertisement.
3. Discuss three basic steps in creating an advertisement.
4. List and describe three major channels of distribution.
5. Design an advertisement for the class product.

CORE INSTRUCTIONAL ACTIVITIES:

1. Collect examples of advertisements which promote an idea and a product.
2. Analyze examples of advertisements and discuss whether they are "good" or "bad" advertisements.
3. Create an advertisement for a class product.
4. Discuss distribution channels (direct, retail, and wholesale).
5. Develop an order form for a class product.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Create a video sales presentation promoting the class product.
2. Role play the job of sales manager and develop a motivational plan to encourage more sales from the sales staff.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Art Supplies

MATERIALS/CORE:

Newspapers
Periodicals
Poster Board

TOOLS AND EQUIPMENT/ADVANCED:

Video Equipment

MATERIALS/ADVANCED:

Same as Core

APPLICATION OF TERMS:

- Advertising
- Graphics
- Authorized Dealer
- Commission
- Quota
- Retail Sales
- Sales Forecast
- Sales Person
- Advertising Agency
- Industrial Sales
- Layout
- Public Service Advertising
- Story Board
- Motivation
- Territories
- Distribution Channels

REFERENCES:

Wright, Thomas, Exploring Manufacturing, South Holland, Ill.: Goodheart-Willcox Company, 1985.

REFERENCE: 4.3

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Liquidating a Company

MAJOR CONCEPT: Liquidation, (dissolution) is a legal process of settling a corporations accounts and going out of business.

TOPICS:

1. Voluntary Liquidation
2. Involuntary Liquidation
3. Steps in Dissolution (Filing Legal Documents, Closing Operations, Selling Assets, Distributing Money)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain reasons for voluntary liquidation of a corporation.
2. Explain reasons for involuntary liquidation of a corporation.
3. List the steps involved in dissolving a company.
4. List the assets that need to be sold to settle all debts.
5. Explain how to divide profits among stockholders.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the reasons for company liquidation.
2. Discuss the steps involved in liquidating a corporation.
3. Dissolve the class corporation.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Categorize the class corporation's assets that must be sold (plant and equipment, materials and work-in-process, finished goods, product plans and process information, etc.).
2. Dissolve the class corporation.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

Class Corporation Assets

TOOLS AND EQUIPMENT/ADVANCED:

None

MATERIALS/ADVANCED:

Class Corporation Assets

APPLICATION OF TERMS:

- Bankruptcy
- Creditor
- Involuntary
- Liquidation
- Certificate of Dissolution
- Capitalism
- Dissolution
- Voluntary
- Assets

REFERENCES:

Wright, R. T. and Henak, R. M., Exploring Production, South Holland, Ill.: Goodheart-Willcox Co., Inc., 1985.

MANUFACTURING TECHNOLOGY

STANDARD CLASSROOM EQUIPMENT LIST

- Overhead Projector W/Screen
- Work Tables
- Stools
- Desk Staplers
- Bulletin Boards
- Desks
- Chairs
- Tape Dispensers
- Chalkboard w/Straight Edge, Triangles, Protractors, and Compasses
- Textbooks, Dictionaries, and other Reference Equipment
- Standard Drafting Equipment: T-Squares, Triangles, Compass Kits, Scales and Drawing Boards

STANDARD MACHINE EQUIPMENT LIST

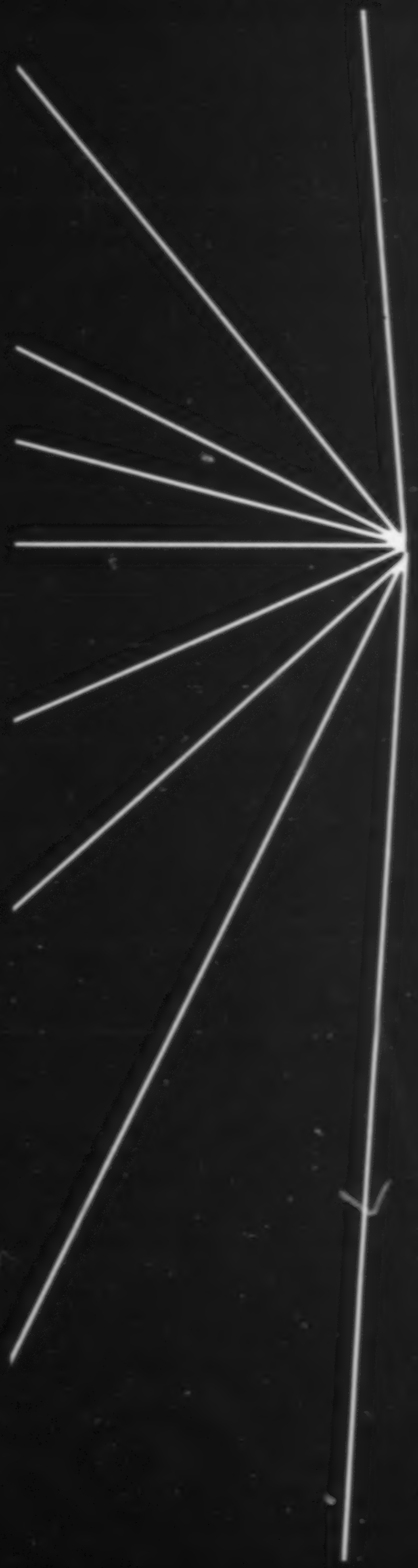
- Bandsaw
- Bench Grinder/Surface Grinder
- Circular Saw
- Drill Press
- Finishing Sander
- Hand Drill
- Heat Treatment Oven
- Jointer
- Planer
- Power Drill
- Route
- Strip Heater
- Stapler/Nailer
- Wood Lathe
- Bar Folder
- Box and Pan Brake
- Disc Sander/Belt Sander
- Drum Sander
- Glue Gun
- Heat Gun
- Jig Saw/Hand
- Paper Cutter
- Plastics Oven
- Radial Arm Saw
- Side Grinder
- Squaring Shear
- Multimeter
- Table Saw

STANDARD HANDTOOL EQUIPMENT LIST

- Adjustable Wrench
- Bar Clamps
- Brace and Bit
- Brayer
- Cement Trowel
- Chisels
- Countersink
- Drafting Boards
- Extension Cords
- File Cleaners
- Hammers (Claw, Ball Peen, Forging)
- Letter/Number Steel Stamp Set
- Measuring Tools
- Pipe Cutter
- Planes
- Propane Torch
- Rubber and Rawhide Mallet
- Screwdrivers
- Soldering Iron
- Squares
- Tape Dispenser
- Tubing/Flaring Tool
- Wire Stripper
- Wrenches
- Anvil
- Bench Knives, Utility Knives, X-Acto Knives
- C-Clamp
- Center Punch
- Coping Saw
- Crosscut Saw/Rip Saw
- Drafting Tools
- Files (assorted)
- Hacksaw
- Hole Saw
- Magnet
- Miter Box with Back Saw
- Pipe Wrench
- Pliers (Slip Joint, Vise Grip, Needle Nose, Linemans, Side Cutter)
- Scissors
- Snips (Aviation and Tinner's)
- Spring Clamps
- T-Square/Triangles
- Tile and Glass Cutter
- 3" and 4" Vise
- Wood Burners

SPECIALIZED TOOLS AND EQUIPMENT LIST

Spirit Duplicator
Computer, Software
Drafting Equipment
Camera
World Globe
Pressure Cooker
Drying Racks
Electric Stove/Hot Plate
Spinning Bobbins
CNC Lathe
Abrasive Cutting Machine
Planer
Sander Belt or Disc
Squaring Shears
Pipe Cutter
Electrical Discharge Machine
Electro-Magnet
Frictional Saw
Metal Bucket
Sheet Metal Punch
Core for Magnet
Red Safe Light
Kiln
Compression Molds
Green Sand Molds-Cope and Drag
Dip Casting and Molds
Investment Mold Ovens
Ball Peen Hammer
Arbor Press
2 Piece Mated Dies
Wood Forms for Water Skis
Anvil
Ceramic Molds
Molds for Clearcast
Forging Hammer
Mig Welder
Soldering Iron
Wood Shaper
Electroplating Equipment
Wire Brushes
Steam Cleaner
Offset Press
Porcelaining Enameling Equipment
Anodizing Tanks
Film Developing Tanks
X-Acto Knives
Measuring Devices
Heat Gun
Hair Dryer
Acrylic Sheet Cutter
Plastics Injection Molder
Rock/Gem Tumbler
Conveyors, Trolleys, Handling Equipment
Paper Making Equipment
VCR, TV
CAD Systems
Encyclopedia
Blender
Wire Screen
Hot Pressing Iron
Stainless Steel Containers
Wire Cards
CNC Milling Machine
Power Hacksaw
Grinder w/Brush Wheel
Bench Shears
Leather Working Tools
Paper Perforator
Glass Cutter
Centrifuge
Oxy-Acetylene Torch
Armatron
Laser Trainer
Developing Trays
LP Gas Furnace
Safety Equipment
Green Sand Mold Patterns
Candle Molds
Wood Carving Tools
Letter Dies/Stamps
Plastic Thermoforming Equipment
Pipe Dies
Pop Rivet Gun
Metal Spinning Lathe w/Tools
Pack Carbonizer
Forging Tools
Sand Blast Machine
Arc Welder
Drill Press
Propane Torch
Spot Welder
Buffing and Polishing Equipment
Ultra-Sonic Cleaner
Paint Sprayer w/Compressor
Screen Print Equipment
Process Camera
Vacuum Frames
Stop Watches
Calculators
Go-No-Go Gauges
Oven
Hot Wire Styrofoam Cutter
Air Compressor
Micrometer



UNITS IN ENERGY, POWER AND TRANSPORTATION TECHNOLOGY
RECOMMENDED INSTRUCTIONAL TIME

		9 WKS	18 WKS	36 WKS
1.	Introduction to Energy, Power/Transportation			
1.1	Past, Present, and Future	.5	1	3
1.2	Sources of Energy	.5	1	4
2.	Energy and Power			
2.1	Basic Terminology		2	4
2.2	Application of Energy	2	4	6
2.3	Measuring Energy and Power		2	4
2.4	Impact of Energy, Power, and Transportation on the Environment			3
3.	Control and Transmission of Power			
3.1	Mechanical Power	1	2	5
3.2	Fluid Power	1	4	6
3.3	Electrical Power	2	3	8
3.4	Automated Control Systems		2	5
3.5	Robotics	3	5	10
4.	Transportation			
4.1	Transportation Basics		2	6
4.2	Principles of Transportation		1	7
5.	Transportation Modes			
5.1	Highway	15	15	20
5.2	Rail		1	5
5.3	Air	2	2	6
5.4	Water		5	10
5.5	Pipeline	2	3	6
6.	Engines			
6.1	External Combustion		2	5
6.2	Internal Combustion	10	10	10
6.3	Automotive Engines		4	5
6.4	Small Internal Combustion Engines		10	15
7.	Advances in Power and Transportation			
7.1	Solar	3	3	7
7.2	Nuclear		1	4
7.3	Space Exploration	2	2	7
7.4	Emerging Systems		2	6
8.	Career Exploration and Planning			
8.1	Careers in Power/Transportation	1	1	3
	Total Hours	45	90	180

NOTES

280

REFERENCE: 1.1

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Energy, Power and Transportation: Past, Present and Future

MAJOR CONCEPT: The Sun is the basic source of energy we have available for our use.

TOPICS:

1. Definition (Energy/Power)
2. How the Earth's Energy Came into Existence
3. Past Sources
4. Present Sources
5. Future Sources

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Differentiate between energy and power.
2. Describe how the solar system serves as the source of all the energy that we use.
3. Trace the development of energy sources used in the home, industry, transportation and defense, including future projections.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the five sources of energy and how each is converted to power (solar, chemical, geo-thermal, nuclear, gravitational).
2. Bring in articles from publications which relate each to the five basic sources.
3. Interview senior citizens on how changes in energy uses affected their lives.
4. Make a poster showing the development of one of the five sources of energy used in the home or industry.
5. Build a small, coil type solar water heater.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Individually, or in groups, build a project tracing the development of energy used in the home, industry, transportation, or defense (including future projections).
2. Research and develop a short report on any one of the sources of energy.
3. Build a solar car using a small D.C. motor and solar cell.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Standard

MATERIALS/CORE:

- Aluminum Foil
- Tubing (rubber or plastic)
- Tubing Clamps
- Plexiglass
- Cardboard
- Black Spray Paint
- Trash Bag

TOOLS AND EQUIPMENT/ADVANCED:

- D.C. Motor
- Gears
- Plastic Wheels
- Solar Cells

MATERIALS/ADVANCED:

- Wood
- Cardboard

APPLICATION OF TERMS:

- Power
- Technology
- Fossil Fuels
- Crude Oil
- Geo-Pressure Reserve
- Solar Energy
- Geo-Thermal Energy
- Energy
- Radiant Energy
- Petroleum
- Refining
- Natural Gas
- Photovoltaic Cells

REFERENCE:

Bohn and MacDonald, et.al., Energy Power and Transportation and Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986.

REFERENCE: 1.2

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Sources of Energy

MAJOR CONCEPT: Our three groups of energy sources are exhaustible, renewable, and inexhaustible.

TOPICS:

1. Exhaustible Energy Sources (Those that cannot be replaced once used.)
2. Renewable Energy Sources (Those that can be used indefinitely if properly managed.)
3. Inexhaustible Energy Sources (Those that will always be available.)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define the terms exhaustible, renewable, and inexhaustible as they relate to energy sources.
2. Name four examples of exhaustible energy sources.
3. List two types of renewable energy sources (wood and plants).
4. List types of inexhaustible energy sources (solar, hydroelectric, wind, tides, ocean thermal, solar salts, hydrogen and geo-thermal).
5. Describe and discuss the national/world-wide concern involving exhaustible energy sources.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss and then list five examples of each type of energy source and relate applications of each.
2. Research and report via poster, display, oral report, etc., on exhaustible energy sources.
3. Define exhaustible, renewable and inexhaustible energy sources in a brief paper to be presented at the end of class.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Build a small working project that illustrates one of the renewable, exhaustible and inexhaustible types of energy.
2. Demonstrate and experiment with various energy sources using power trainer.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Power Trainer per State Equipment List

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

Power Trainer per State Equipment List

MATERIALS/ADVANCED:

None

APPLICATION OF TERMS:

Exhaustible Energy Sources
Renewable Energy Sources
Nuclear Energy
Electrons
Protons
Methanol
Mineral Rights
Ocean Thermal Energy
Coal
Petroleum
Oil Shale
Fractionating
Natural Gas
Tight Sand Reserves
Synthetic Fuels
Isotopes
Photovoltaic Cells
Turbines
Inexhaustible Energy Sources
Synthetic Fuels
Nuclear Reactor
Neutrons
Gasohol
Hydro Electric
Turbine
Fossil Fuels
Oil
Oil Pockets
Tar Sands
Refining
Geopressure Reserves
Processing Plants
Uranium
Bioconservation
Solar Panels

REFERENCE:

Bohn and MacDonald, et.al., Energy Power and Transportation and Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986.

REFERENCE: 2.1

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Basic Terminology

MAJOR CONCEPT: An understanding of the basic terminology of power and energy is essential to the world of technology.

TOPICS:

1. Energy
2. Power
3. Work
4. Force
5. Efficiency
6. Prime Mover
7. Output Work
8. Input Work
9. AMA (Actual Mechanical Advantage)
10. TMA (Theoretical Mechanical Advantage)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define the terms from topics list.
2. List at least four prime movers (wheel and axle, lever, inclined plane, screw, wedge and pulley).
3. Use formulas to describe work, efficiency, theoretical mechanical advantage, and actual mechanical advantage.

CORE INSTRUCTIONAL ACTIVITIES:

1. Solve problems dealing with work, efficiency, theoretical mechanical advantage and actual mechanical advantage using appropriate formulas.
2. Observe demonstration of a lever and explain terms used in this section.
3. Report on practical uses of four prime movers.
4. Use a model car with first unoiled axles, then oiled axles, to show the relationship between AMA, TMA and variances thereof.
5. Write the definition of the topic words and give examples.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Complete a worksheet of problems using the work, efficiency, and theoretical mechanical advantage formulas. (See Reference)
2. Using the power trainer, perform experiments using theories of work efficiency, theoretical mechanical advantage and actual mechanical advantage.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Lever Model Car w/ Moveable Axles
Oil/Graphite

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

Teacher prepared worksheet on mechanical advantage formulas.
Power Trainer as listed in the Equipment List from the State Department of Education.

MATERIALS/ADVANCED:

None

APPLICATION OF TERMS:

See Topics List

REFERENCE:

Bohn and MacDonald, et.al., Energy Power and Transportation and Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986.

REFERENCE: 2.2

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Application of Energy

MAJOR CONCEPT: Application of energy for constructive use involves conversions from one form to another.

TOPICS:

1. History of Energy Applications
2. Conversions of Energy (Examples provided)
   a) Mechanical (Generator-mechanical to electrical)
   b) Thermal (Thermocouple-heat to electrical)
   c) Light (Photocell-light to electrical)
   d) Chemical (Battery-chemical to electrical)
   e) Electrical (Motor-electrical to mechanical)
   f) Nuclear (Nuclear matter into heat energy)
   g) Radiant (Sunlight-photosynthesis)
3. Control:
   a) Storage (potential)
   b) Law of energy conservation
   c) Conversion
4. Application (Kinetic)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List the seven forms of energy and name the possible sources of each.
2. Differentiate between potential and kinetic energy.
3. Explain how friction reduces efficiency in energy control systems.
4. Describe how energy is stored and why storing it is important.
5. State the Law of Energy Conservation.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss and define the forms of energy found in the topics list.
2. Construct a reservoir with a turbine wheel to demonstrate conversion of potential energy to kinetic energy.
3. Use an electrical pump to move water from a lower level to a higher level, showing the conversion from kinetic to potential energy.
4. Show how a bicycle converts chemical energy into mechanical and heat energy.
5. Experiment with simple ways to unleash energy. Solar cell motor, Lemon Battery , Tea Kettle Pinwheel, (water to steam).

ADVANCED INSTRUCTIONAL ACTIVITIES:

Design an energy control system to show how friction reduces efficiency in an energy control system. (Example: Use various water piping systems to illustrate efficiency of water flow.)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Bicycle
- Aquarium Pump
- Tea Kettle
- Zinc Strip
- Small Pin Wheel
- Hand pump (Create water pressure)
- Solar Cell
- Copper Strip
- VOM Meter

MATERIALS/CORE:

- Batteries
- Plastic Trash Bag
- Lemons
- Sand
- Milk Carton

TOOLS AND EQUIPMENT/ADVANCED:

- PVC Pipe
- Various Fittings (Ells, Tees, Y's, Caps)

MATERIALS/ADVANCED:

- PVC Pipe
- Tape

APPLICATION OF TERMS:

- Mechanical
- Thermal
- Electrical
- Potential
- Kinetic
- Radiant
- Duration
- Application
- Efficiency
- Storage
- Hydraulics
- Law of Energy Conservation
- Chemical
- Light
- Nuclear
- Conversion
- System
- Placement
- Control
- Fuel
- Friction
- Transmission
- Energy Control System

REFERENCES:

Industrial Arts Instructional Tasks/Competencies for Power and Transportation Technology@DATA DATA.DOC@@FIELD1@, Richmond, Virginia: Commonwealth of Virginia Department of Education: Vocational and Adult Education, 1984.

Industrial Technology Systems Handbook for Industrial Arts/Technology Education, Columbus, Ohio: Ohio Department of Education, Ohio State University, 1985.

MacDonald, Bohn, Fales and Kuetemeyer, Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight, 1986.

REFERENCE: 2.3

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Measuring Energy and Power

MAJOR CONCEPT: Work and power is measured to determine energy efficiency.

TOPICS:

1. Work = Weight X Distance
2. Horsepower = $\frac{\text{Weight (lbs) X Distance (ft)}}{\text{Time (sec) X 550}}$
3. Force = Pressure X Area
    a) Weight
    b) Torque
    c) Pressure
4. British Thermal Unit (B.T.U.) Heat required to raise the temperature of 1 lb. of water 1 degree (F.).
5. Units of Measure
    a) English/Customary
    b) Metric

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define power, force, work, torque, horsepower, pressure, B.T.U.
2. Make use of the English/Customary measuring system to solve problems.
3. Name and describe the three most common forms of power.
4. Explain the relationship between energy, work, and power.
5. Differentiate between force and torque.
6. Explain how pressure is measured and how it differs from force.

CORE INSTRUCTIONAL ACTIVITIES:

1. List and define power, force, torque, B.T.U., and horsepower.
2. Give examples of three common forms of power and where they are applied. (Example: Electrical-electric motor, Mechanical-lever and fulcrum, Chemical-battery)
3. Discuss the relationship between energy, work and power.
4. Observe a teacher demonstration of power, work, torque, B.T.U. and horsepower using the power experimenter lab package as shown on the State Department of Education State Equipment List.
5. Work problems using both systems of measurement. (English/Customary Metric)

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Work problems dealing with force and pressure. (Students will perform experiments in section 3.2)
2. Perform guided activities using power experimenter. (See Activity Guide)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Air Compressor
Hydraulic Pump
Stairs
Tape Measure
Stop Watch w/Second Hand
Power Experimenter per State Equipment List
Dynamometer
Torque Wrench
Thermometer
Hotplate

MATERIALS/CORE:

Balloon
Brick (weight)
Concrete Block (Known weight)

TOOLS AND EQUIPMENT/ADVANCED:

Same as Core

MATERIALS/ADVANCED:

Worksheets on problems dealing with force and pressure (See Reference)
Provide handout of student experiments to be done using power trainer.

APPLICATION OF TERMS:

Torque
Metric
Heat
Foot-pounds
Dynamometer
Horsepower
Pressure
Work
Energy
BTU
SI (International System of Units)

REFERENCES:

Bohn, MacDonald, Fales, Kuelemeyer, Energy Power and Transportation Technology, Encino, CA: Bennett and McKnight, 1986. (to include instructor's guide and student activity guide)

Cook, Earl, Man, Energy, Society San Francisco, CA: W. H. Freeman and Company, 1976.

Duffy, Joseph W., Power - Prime Mover of Technology, New York, NY: McKnight and McKnight, 1972.

REFERENCE: 2.4

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Impact of Energy, Power, and Transportation on the Environment

MAJOR CONCEPT: Energy, power, and transportation have an impact on the environment.

TOPICS:

1. Positive Effects (Higher standards of living, lakes for recreation, development of cleaner sources of energy)
2. Negative Effect (Pollution - air, water, rain, destruction of natural land and "sight" pollution)
3. Controlling Pollution
4. Conservation (Saving energy and reducing pollution)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe how energy has raised our standard of living.
2. Define pollution.
3. Describe various types of air, water and land pollution.
4. Define acid rain, describe how it forms, and explain the damage it causes.
5. Describe thermal pollution and explain how it is harmful to fish and plant life.
6. Describe other forms of pollution caused by wood, geo-thermal power plants, hydroelectric plants, and nuclear power plants.
7. Discuss several ways that pollution caused by energy can be controlled.
8. Name ways to conserve energy at home, in business, industry, and transportation.

CORE INSTRUCTIONAL ACTIVITIES:

1. Using magazines, find pictures showing different types of pollution.
2. Discuss ways of controlling pollution.
3. Compare several different energy sources. Make a chart showing the least to most polluting type of energy.
4. Discuss acid rain; causes and effects.
5. Demonstrate and discuss ways to conserve energy.
6. Experiment with various Ph waters to show the effect on plants.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Take a test of local rain water and test for acidity.
2. Take several tests of water from local areas and compare results.
3. Sprinkle a small amount of soot on a plant leaf and observe results several days later.
4. Test the wattage used and measure the light emitted from various combinations of light bulbs. Determine the most energy conservation combination for the identified tasks.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Fishbowl
- Weedkiller
- Light Meter
- Boarderbaund Science Tool Kit
- Hot Plate
- VOM Multimeter

MATERIALS/CORE:

- Live Plant
- Posterboard
- Markers
- Westinghouse Information on Nuclear Waste
- Magazines
- Rubber Gloves

TOOLS AND EQUIPMENT/ADVANCED:

- Test Tubes
- Test Tube Rack
- Test Tube Stoppers

MATERIALS/ADVANCED:

- Litmus Paper
- House Plant
- Test Data Forms (graph paper)
- Light Bulbs and Sockets

APPLICATION OF TERMS:

- Environment
- Fossil Fuels
- Smog
- Emission
- Carbon Monoxide
- Earth Warming
- Greenhouse Effect
- Cooling Towers
- Hydroelectric Energy
- Air Turbines
- Nuclear Energy
- Radioactivity
- Energy Conservation
- Weatherstripping
- Pollution
- Air Pollution
- Hydrocarbons
- Nitrogen Oxides
- Particulates
- Carbon Dioxide
- Water Pollution
- Geo-thermal Energy
- Hydro-Pneumatic Power System
- Receiver
- Radioactive Waste
- Solar Energy
- Insulation
- Double-pane Windows

REFERENCES:

Bohn, MacDonald, Fales, Kuelemeyer, Energy Power and Transportation Technology, Encino, CA: Bennett and McKnight, 1986. (to include instructor's guide and activity guide)

Cook, Earl, Man, Energy Society San Francisco, CA: W. H. Freeman and Company, 1976.

Duffy, Joseph W., Power - Prime Mover of Technology, New York, NY: McKnight and McKnight, 1972.

REFERENCE: 3.1

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Mechanical Power

MAJOR CONCEPT: Mechanical power uses mechanical energy to do work through the use of simple machines, mechanical power systems, power transmissions and friction.

TOPICS:

1. Mechanical Advantage
2. Simple Machines (lever, wheel and axle, pulleys, inclined plane, wedge, screw)
3. Mechanical Power Systems
4. Power Transmissions and Friction

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe what is meant by mechanical advantage.
2. Identify the six simple machines.
3. Describe ways to change mechanical power such as on/off switches, gears, shafts and pulleys.
4. Identify spur gear, bevel gear, miter gears and worm gear sets.
5. Describe how power is lost in mechanical power transmission due to friction.

CORE INSTRUCTIONAL ACTIVITIES:

1. Have students observe experiments, then calculate mechanical advantages.
2. Solve problems determining mechanical advantage:

$$\frac{\text{Input Distance}}{\text{Output Distance}} = \frac{\text{Output Force}}{\text{Input Force}}$$

3. Find devices at home that use the principles of simple machines.
4. Have students describe how a clutch works in a power transmission by using friction.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Perform experiments in mechanical power using gears, pulleys and belts, sprockets, chains, clutches and couplings, on/off switching, changes in power, direction, and speed and force changes.
2. Have students calculate mechanical advantage of a 10-speed bicycle.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Car Jack
- Pulleys
- Worm Gears
- Spur Gears
- Inclined Plane
- Ball Bearing
- Levers
- Wheel and Axle
- Bevel Gears
- Miter Gears
- Wedge
- Needle Bearings
- Power Trainer per State Equipment List

MATERIALS/CORE:

- Sewing Thread Spools
- Bottle Caps (Gears)
- Oil/Graphite

TOOLS AND EQUIPMENT/ADVANCED:

- Calculator
- Computer

MATERIALS/ADVANCED:

- Same as Core Activity

APPLICATION OF TERMS:

- Mechanical Power
- Simple Machines
- Machine Output
- Ratio
- Pivot Point
- Force Lever Arm
- Wheel and Axle
- Revolution
- Inclined Plane
- Screw
- Mechanical Power System
- Reciprocating Motion
- Linear Motion
- Clutches
- Universal Joint
- Friction
- Machines
- Mechanical Advantage
- Machine Input
- Lever
- Fulcrum
- Load Lever Arm
- Circumference
- Fixed Pulley/Moveable Pulley
- Wedge
- Gears
- On/Off Switching
- Rotary Motion
- Control Devices
- Couplings
- Power Transmission
- Bearings

REFERENCES:

Bohn and McDonald, Power: Mechanics of Energy Control, Encino, CA: McKnight Publishing Company, 1983.

Bohn, MacDonald, et.al., Energy Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986.

REFERENCE: 3.2

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Fluid Power

MAJOR CONCEPT: A fluid power system converts, transmits, controls and applies energy through a pressurized system within a closed circuit.

TOPICS:

1. Parts of Fluid Power System
2. Types (pneumatic, hydraulic and vacuum)
3. Theory of Operation
4. Application

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify and explain the function of each of the seven major parts of a fluid power system. (fluid, receiver or reservoir, filler, pump or compressor, control valve, transmission lines and actuator).
2. Explain the basic principles of pneumatics, hydraulics and vacuums and how gauges are used to measure them.
3. Explain why hydraulic power is suitable in situations where large forces have to be applied or controlled.
4. Perform basic fluid power calculations.

CORE INSTRUCTIONAL ACTIVITIES:

1. After a demonstration use a schematic of a typical fluid power system to identify the major parts of the system.
2. Use the fluid power trainer to demonstrate the principles of pneumatics, hydraulics and vacuum, then discuss the application of each.
3. Using Pascal's Law discuss how a fluid is able to transmit force, as well as, change the relationship between force, distance and speed. (See Reference)
4. Make a display of pictures cut from magazines, etc., showing everyday use of fluid power (poster, bulletin board).
5. Use fluid power gauges for measurement.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Using syringes, tubing, fittings and water, assemble a basic or hydraulic system.
2. Using the power trainer, conduct experiments to determine various flows and pressures when given a schematic from the teacher.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Fluid Power Experimenter per State Equipment List
- Thermometers (C/F)
- Hydraulic Jack
- Safety Glasses
- Barometer
- Air Compressor

MATERIALS/CORE:

- Magazines
- Teacher Prepared Schematics (See References)
- Poster Board

TOOLS AND EQUIPMENT/ADVANCED:

- Hypodermic Syringes
- Tubing Clamps
- Power Trainer
- Clear Plastic Tubing
- Assorted Tubing Fittings

MATERIALS/ADVANCED:

- Teacher Prepared Schematics of Hydraulic System

APPLICATION OF TERMS:

- Fluids
- Pneumatics
- Volume
- Cylinder
- Piston
- Boyle's Law
- Valves
- Filter
- Actuator
- Pressure Relief Valve
- Air Over Oil
- Primary Filter
- Pressure Cylinder
- Contaminants
- Lubricator
- Valve Pump
- Hydraulics
- Vacuum
- Cubic Feet
- Pressurize
- Compression
- Transmission and Control
- Reservoir or Receiver
- Transmission Line
- Connectors
- Bellows
- Air Inlet
- Storage Tank
- Hydraulic Filter
- Pneumatic Filter
- Gear Pump
- Compressor

REFERENCES:

Bohn, Fales, et.al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986.

Nolansky, Nagohusian and Henke, Fundamentals of Fluid Power, Albany, NY: Lab Volt Technical Systems.

Suess, Dugger, et.al., Introduction to Power System, Reston, Virginia: ITEA, 1985.

REFERENCE: 3.3

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Electrical Power

MAJOR CONCEPT: An operating electrical power system has electricity traveling from a power source through control components to a work load and returning to the power source.

TOPICS:

1. Safety
2. Sources and Types of Electricity (chemical, light, pressure, heat, magnetic)
3. Basic Laws of Electricity
4. Electrical Components
5. Circuits
6. Measurements and Calculations

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Demonstrate safe procedures in dealing with electricity.
2. Explain AC and DC.
3. Explain the relationship between magnetism and electricity.
4. Name 3 conductors and 3 insulators (examples: conductors-copper, silver, aluminum inductors-glass, plastic, wood).
5. Identify and find 2 functions of electrical components (Examples: Resistance, switching, storage, amplification, converting AC to DC).
6. Explain and use Ohm's Law and Watt's Law.
7. Explain amps, ohms, and volts.
8. Construct an electrical circuit.
9. Use a VOM to measure amps, ohms, and volts.
10. Explain operation of generators and motors.

CORE INSTRUCTIONAL ACTIVITIES:

1. Perform experiments using the trainer to show:
   a) Differences between parallel and series circuits
   b) Proper use of meters
   c) Ohm's Law
2. Demonstrate sources of electricity. (Chemical-Battery, Solar-Photovoltaic Cell)
3. Demonstrate function of commonly used electrical components. (Switching, resistance, fuses, relays, etc.)
4. Use experiments to show difference between AC and DC. (Oscilloscope-basic experiments).
5. Complete a worksheet of basic electrical problems.
6. Pass a teacher prepared safety test.
7. Use a Volt Ohm Meter to determine the conductivity and insulation quality of various materials.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Disassemble an electric motor and generator, identify components, explain functions of each, and reassemble.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Electronics Trainer per State Equipment List
Volt/Ohm Meter
AC/DC Power Supply

MATERIALS/CORE:

Hookup Wire
Miniature Bulbs (1.5v)
Batteries

TOOLS AND EQUIPMENT/ADVANCED:

Needlenose Pliers
Crescent Wrench
Wrench Set
Generator
Screwdriver
Socket Set
Ball Peen Hammer
Electric Motor

MATERIALS/ADVANCED:

None

APPLICATION OF TERMS:

Alternators
Amperage
Batteries
Charged Particles
Collector
Coulomb
Direct Current (DC)
Electromagnet
Elements
Fuses
Hole Theory
Magnetism
Ohm's Law
Parallel Circuit
Primary Cell
Relays
Secondary Cell
Series Circuit
Solenoid
Terminals
Transformer
Variable Resistor
Wattage
Alternating Current
Base
Cells
Circuit Breakers
Conductor
Diode
Electrolyte
Electron Theory
Emitter
Generators
Insulator
Motors
Overload Control
Permanent Magnets
Rectification
Resistance
Semiconductor
Slip Rings
Switches
Toggle Switch
Transistor
Voltage

REFERENCES:

Bohn, MacDonald, et al., Energy, Power and Transportation, Encino, CA: Bennett and McKnight, 1986.

Smith, Howard, Exploring Energy Sources/Application/Alternatives, South Holland, Illinois: Goodheart-Willcox, Co., 1985.

Stafford, Edward L., The Complete Handbook of Robotics, Blue Ridge Summitt, PA: TAB Books, Inc., 1978.

NOTES

REFERENCE: 3.4

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Automatic Control Systems

MAJOR CONCEPT: Automated control is continuous automatic operation for the most efficient use of energy.

TOPICS:

1. Automated Systems
2. Instruments and Sensors
3. Computers and Robots
4. Impact on Society

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain an automated control system.
2. Explain how computers improve automated control systems.
3. List advantages and disadvantages of the robot as an industrial labor supply.
4. List and explain how sensors are used in automated systems.
5. Describe an automated control system operating at home.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss automatic controls or controlled devices in homes. (Thermostat, washing machines, etc.).
2. Build a thermostat-regulated circuit.
3. Build a timer-operated system and apply it to a device such as a radio or light.
4. Assemble an electric circuit using a photo voltaic cell and timer.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Using the electrical experimenter, build a fire alarm system.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Assorted Electrical Hand Tools
Electrical Experimenter
Robot Kits
Heat Lamp

MATERIALS/CORE:

Thermostat
Power Supply
Insulator
Transformer
Capacitor
Sensor
Conductor
Solar Kit
Timer
Diode

TOOLS AND EQUIPMENT/ADVANCED:

Electrical Experimenter as listed in the State Department of Education List

MATERIALS/ADVANCED:

Computer Software
Milling Material

APPLICATION OF TERMS:

Artificial Intelligence
Automation
Bits
Computer
Computer Aided Manufacturing
Memory
Data Processing
Microcomputer
Software
Personal Computer
Microprocessor
Robot
Automated Control Systems
Central Processing Unit
Byte
Computer Aided Design
Automated Manufacturing Devices
Computer Printout
Expert System
Information Management
Output Devices
Sensor
Main Frame Computer

REFERENCES:

Bohn, MacDonald, et al., Energy, Power and Transportation, Encino, CA: Bennett and McKnight, 1986.

Smith, Howard Bud, Exploring Energy Source/Application/- Alternatives South Holland, Illinois: Goodheart-Willcox Co., Inc., 1985.

Stafford, Edward L., The Complete Handbook of Robotics, Blue Ridge Summit, PA: TAB Books, Inc., 1978.

REFERENCE: 3.5

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Robotics

MAJOR CONCEPT: Robotics is the field of study which involves combining electromechanical devices with a controller to perform repetitive tasks.

TOPICS:

1. History of Robotics
2. Basic Operating Principles
3. Actuators for Robots
4. Controlling Devices
5. Applications of Robots

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Trace history and application of robots.
2. Define robotic terminology.
3. Outline and diagram the work envelope for a robot.
4. Identify the basic operating systems of a robot.
5. Describe the function of robots in American history.
6. List advantages and disadvantages of replacing workers with robots.
7. Explain sensing systems used in making robots "intelligent".
8. Identify common controllers used to operate robots.
9. Operate a robot to simulate an industrial application.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss robotic terminology.
2. Demonstrate and operate a robot to determine its work envelope.
3. Compile a work list of robotic operations.
4. Debate the advantages and disadvantages of robots.
5. Prepare poster depicting systems of a robot.
6. Construct a time-line showing the history and development of robotics.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Program a robot to simulate an industrial application of a robot.
2. Perform experiments in interfacing sensing and output devices to a computer.
3. Debate the advantages and disadvantages of replacing workers with robots.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer
Robot Trainer per State Department Equipment List
Experimenter Board interfaced with computers

MATERIALS/CORE:

- Electrical Hookup Wire
- Block
- Friction Tape

TOOLS AND EQUIPMENT/ADVANCED:

- Miscellaneous Sensing Devices (thermistor, mercury switches, humidistats, sliding potentiometers)
- Miscellaneous Output Devices (solid state relays, light emitting diodes, low voltage motors, light bulbs, solenoids, buzzers)
- Robotic Arm and Teach Pendent (Interface)
- Computer and Cables

MATERIALS/ADVANCED:

Same as Core Activity

APPLICATION OF TERMS:

- Work Envelope
- Relay Logic Controllers
- Rotating Drum Controllers
- Single-board Controllers
- Roll Degree
- Disadvantages
- Actuators
- Accuracy
- Payload
- Repeatability
- Automatic
- Application
- Robot
- Controller
- Drive Type
- Travel
- Drive
- Axis
- Table
- Air Logic Controllers
- Non-intelligent Controllers
- Optical Sensors
- Geometric Motion Configurations
- Sensors
- Advantages
- Resolution
- Dynamic Performance
- Load Capacity
- Operational Speed
- Automation
- Artificial Intelligence
- Robotic
- Electronic Interface
- Feed Rate
- Mechanism
- Reach
- Height
- Base

REFERENCES:

Coffron, James W., The Apple Connection, Berkeley, CA: Sybex, Inc., 2344 Sixth St., 1986.

Coffron, James W., The Commodore 64 Connection, Berkley, CA: Sybex, Inc., 2344 Sixth St., 1986.

Potter, Tony, How to Make Computer-Controlled Robots, Tulsa, OK: D. C. Publishing Company, 1987.

REFERENCE: 4.1

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Basic

MAJOR CONCEPT: Transportation is the movement of human and other cargo using vehicles such as buses, trucks, airplanes, railroad cars, and conveyors.

TOPICS:

1. Moving Passengers
2. Moving Cargo: Bulk or Break Bulk
3. Three Basic Users and Providers of Transport (personal, commercial, governmental)
4. Modes of Transportation
5. Intermodel Transportation
6. On-site Transportation

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define transportation and how it affects society.
2. List the two main types of cargo (bulk and break bulk cargo).
3. List the three groups providing transportation (personal, commercial, and governmental).
4. Identify five modes of transportation (highway, rail, air, water, pipeline, conveyor and elevator, etc.).
5. Explain intermodel transportation and name examples of intermodel passenger and cargo transportation.
6. Define containerization and list advantages (saves labor, time and cost).
7. Identify at least two on-site transportation devices used to move people (elevators, escalators, moving sidewalks, monorails, cableways, and automated guideway transit).

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the meaning of transportation and its importance to our society.
2. Discuss the different types of passenger and cargo transportation systems.
3. Discuss the three types of users and providers of transportation.
4. Identify five modes of transportation.
5. Write a description or draw a picture of intermodel transportation vehicles in the area.
6. Construct a model transportation unit using various materials to run on a suspended string. (See Transportation Activity in Technology Activity Idea Book) ITEA.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design a container for transporting a breakable object (egg, glass, etc.).
2. Construct a prototype of the container designed in Advanced Activity 1.
3. Test the prototype under various stress conditions.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

- Monofilament Fishing Line
- Paper Clips
- Clothes Pin
- Small Paper Bag
- Popsicle Stick
- Fishing Swivels
- Masking Tape
- Balloon(s)
- Soda Straw
- Strip of Aluminum Foil
- Pipe Cleaners
- Napkins

TOOLS AND EQUIPMENT/ADVANCED:

As needed for the design and construction of Advanced Activities 1 and 2.

MATERIALS/ADVANCED:

As needed for the design and construction of Advanced Activities 1 and 2.

APPLICATION OF TERMS:

- Transportation
- Freight
- Profit
- Intermodel Transportation
- Container Ships
- Monorail
- Break Bulk Cargo
- Terminals
- Control System
- Guidance System
- Power Transmission System
- Thrust
- Cargo
- Place Utility
- Modes
- Cranes
- Parcels
- Cable Way
- Vehicles
- Fleet
- Fixed Route
- Guideway
- Random Route
- Support/Cover System

REFERENCES:

Bohn, MacDonald, et al., Energy, Power and Transportation, Encino, CA: Bennett and McKnight, 1986. (To include Instructors Resource Guide)

Goetsch, David L. and Nelson, John A., Technology and You, Albany, NY: Delmar Publishers, Inc., 1987.

Hacker, Michael, and Barden, Robert A., Technology in Your World, Albany, NY: Delmar Publishers, Inc., 1987.

"Technology Activities", ITEA, Reston, VA, 1986.

REFERENCE: 4.2

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Principles of Transportation

MAJOR CONCEPT: Input, processes, and output are the key ingredients of a transportation system.

TOPICS:

1. Input (Capital, working capital, stocks, fixed capital, people and energy)
2. Processes (Management processes, planning, organizing, controlling, production processes, preparing to move)
3. Output (Movement of passengers and cargo)
4. Government Controls on Transportation

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe the difference between fixed capital and working capital.
2. Explain regulation and deregulation.
3. Discuss the function of three major types of management activities.
4. Identify the factors that are being controlled when operating vehicles.

CORE INSTRUCTIONAL ACTIVITIES:

1. Choose one method of transportation and explain the three principles of it.
2. Using several modes of transportation and a map, plot a route from home to a given destination.
3. Develop charts and diagrams to explain the school transportation systems.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Obtain transportation schedule for one of the passenger transportation modes. Plan a trip, using a U.S. map, to and from different destinations. Organize the plans in a step-by-step order.
2. Create a company that needs transportation to deliver its product. Determine the best way to ship the product depending on what is manufactured, the volume involved, delivery time, destination and cost.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

Charts	U.S. Maps
Schedules	

TOOLS AND EQUIPMENT/ADVANCED:

None

MATERIALS/ADVANCED:

None

APPLICATION OF TERMS:

- Transportation System
- Capital
- Output
- Production Processes
- Planning
- Organizing
- Vehicle Operation
- System Control
- Controlling System
- Air Traffic Controllers
- Input
- Management Processes
- Departure
- Destination
- Working Capital
- Moving
- In-route Services
- Completing the Move
- Directing
- Reporting

REFERENCES:

Bohn, MacDonald, et al., Energy, Power and Transportation, Encino, CA: Bennett and McKnight, 1986. (To include Instructors Resource Guide)

Goetsch, David L. and Nelson, John A., Technology and You, Albany, NY: Delmar Publishers, Inc., 1987.

Hacker, Michael, and Barden, Robert A., Technology in Your World, Albany, NY: Delmar Publishers, Inc., 1987.

"Technology Activities", ITEA, Reston, VA, 1986.

REFERENCE: 5.1

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Highways

MAJOR CONCEPT: The movement of passengers and cargo over roads and highways is called highway transportation.

TOPICS:

1. Features and Benefits
2. Companies and Services
3. Highway Transport Vehicles
4. Physical Facilities
5. Regulating Agencies

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define Highway Transportation and tell how it affects our economy.
2. Identify factors that make highway transportation flexible (Inter City-Intra City).
3. Identify commercial freight companies and give example.
4. Explain "owner-operator" and discuss the advantages and disadvantages of it.
5. Explain the advantages of tractor-trailer combinations as opposed to other forms of freight movement.
6. Describe two basic activities that occur in freight terminal (loading and unloading).
7. Identify several agencies responsible for governing or regulating transport systems and discuss some of the regulations imposed by them.
8. Compare passenger service (cars and buses) with freight service (transfer trucks, delivery trucks).

CORE INSTRUCTIONAL ACTIVITIES:

1. Design a plan for getting to school on time and returning home in the afternoon using public transportation.
2. Trace the transportation of food from the farm to the school lunch room.
3. Design models showing the history of highways.
4. Study and report on highway regulations using materials available from State Agencies.
5. Discuss the economic impact of highway transportation in your community.
6. Compile a list of local freight companies using phone book or information from the local Chamber of Commerce.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Build and race a Metric 500 dragster.
2. Develop several mathematical examples of miles per gallon, percent tire tread wear and oil consumption ratios. (This may work as a cross curriculum activity with the math department).

3. Research one small aspect of the U.S. Interstate Highway System and show how it is a vital link in our national economy. (Information on subjects such as planning, construction, laws, sizes, use and services can be found at the local libraries and from the S.C. State Department of Highways).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

Information available from: S.C. Highway Department, Columbia, SC 29601

TOOLS AND EQUIPMENT/ADVANCED:

As needed in the construction of the Metric 500 Dragster

MATERIALS/ADVANCED:

Metric 500 Kits

CO^2 Cartridges

APPLICATION OF TERMS:

Cab
Charter
Kingpin
Transmission
Limited Access
Interchange
Motor Coaches
Motor Freight Carriers

REFERENCES:

Bohn, MacDonald, et al., Energy, Power and Transportation, Encino, CA: Bennett and McKnight, 1986. (To include Instructors Resource Guide)

Goetsch, David L. and Nelson, John A., Technology and You, Albany, NY: Delmar Publishers, Inc., 1987.

Hacker, Michael, and Barden, Robert A., Technology in Your World, Albany, NY: Delmar Publishers, Inc., 1987.

REFERENCE: 5.2

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Rail

MAJOR CONCEPT: Moving people and goods in vehicles that run on rails is called rail transportation.

TOPICS:

1. Passenger Service
   - a) AMTRACK
   - b) Rapid Transit
     - 1. Elevated
     - 2. Subway
     - 3. On grade
     - 4. Regional
2. Freight Service
   - a) Unit (same type cargo to same destination-ex. Coal Hauler or Fruit Express)
   - b) Regular Freight (variety of cargo and destinations)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe and give examples of two categories of rail transportation (Rapid Transit and Freightliners).
2. Explain Rolling Stock.
3. List and describe four types of railcars.
4. Describe what happens at a classification yard.

CORE INSTRUCTIONAL ACTIVITIES:

1. Using a model train system, simulate the transport of cargo/passengers from one destination to another.
2. Role play workers in a classification yard.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Construct various types of railcars from cardboard (or appropriate materials) and discuss use of each.
2. Simulate scheduling, monitoring and controlling systems used in the rail freight business. (Can use model train and truck to simulate selected activity.)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Model Train Set

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

Model Train Set
Model Truck

MATERIALS/ADVANCED:

As needed for construction of model rail cars.

APPLICATION OF TERMS:

AMTRACK
Ballast
Gauge
Rapid Transit
Road Bed
Unit Trains
Dispatcher
Automatic Car Identification
Elevated Trains
On-Grade
Right-of-Way
Subways
Rolling Stock
Terminal

REFERENCES:

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight, 1986. (To include Instructor's Guide.)

Goetsch, David L., and Nelson, John A., Technology and You, Albany, NY: Delmar Publishers, Inc., 1987.

Hacker, Michael, and Barden, Robert, Technology In Your World, Albany, NY: Delmar Publishers, Inc., 1987.

REFERENCE: 5.3

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Air

MAJOR CONCEPT: Air transportation is the use of a vehicle to move passengers and cargo through the earth's atmosphere.

TOPICS:

1. History of Flight
2. Principles of Aircraft
3. Types of Aircraft
4. Air Transportation System
5. Regulatory Agencies
6. Career Opportunities

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain how an airplane flies using the terms lift, gravity, thrust and drag.
2. Complete a time line showing the significant developments in aviation.
3. Give examples of the types of aircraft and discuss their differences.
4. Explain basic power sources of aircraft.
5. Identify and discuss the function of the parts of an aircraft.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the history of air transportation, air carriers and aircraft.
2. Use a model or illustration to discuss principles of flight.
3. Discuss airport facilities, air carriers, airfreight, FAA, and the various associated career opportunities.
4. Collect various airline advertisements from the local newspaper and compare rates, time, and other information.
5. Construct and fly airplane models (U-control model, rubber-band power model and/or a paper airplane-may require additional research).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Write a three to five page research paper on a specific type of aircraft.
2. Test the flight stability of a balsa wood airplane. (See Activity #23, Energy, Power and Transportation Technology Activity Guide.)
3. Hold a "paper airplane" contest.
4. Experiment with various contoured balsa wing designs and determine aerodynamic advantages and disadvantages of each (Balsa for wings, fan for wind source, spring scale for testing).
5. Construct a model rocket airplane and launch it.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Any tools or equipment needed for the construction of model airplanes.

MATERIALS/CORE:

Model or illustration on Principles of Flight
Current Newspapers
Materials as needed to construct a model airplane

TOOLS AND EQUIPMENT/ADVANCED:

Spring or Postage Scale
Model Rocket Launch Kit
Motorized Fan

MATERIALS/ADVANCED:

Balsa Wood
Model Rocket Engine
Model Rocket Kit

APPLICATION OF TERMS:

Aircraft
Airlayers
Airport
Blimp
Charter Airlines
Domestic Airlines
Ground Vehicle
Jet Planes
Drag
Taxis
FAA
Thrust
Airframe
Airlines
Airspace
Baggage
Commuter Airline
General Aviation
Helicopters
Lift
Prop Planes
Tugs
Gravity

REFERENCES:

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight, 1986. (To include Instructor's Guide.)

Goetsch, David L., and Nelson, John A., Technology and You, Albany, NY: Delmar Publishers, Inc., 1987.

Hacker, Michael, and Barden, Robert, Technology In Your World, Albany, NY: Delmar Publishers, Inc., 1987.

REFERENCE: 5.4

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Water

MAJOR CONCEPT: Water transportation is the movement of cargo and passengers by vessels on water.

TOPICS:

1. Passenger and Cargo Transportation
2. Domestic and International Transportation
3. Water Transport Vessels
4. Physical Facilities
5. Transportation Routes
6. Types of Power Plants (e.g. steam, diesel, wind, turbo, air and nuclear)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List the two main types of water transportation services (barges and ships).
2. Define terms used in water transportation systems.
3. Explain why a general cargo ship is also called a break-bulk ship.
4. Locate on a map the inland waterways of the United States.
5. Explain why it is not economical for ships to stay in port very long.

CORE INSTRUCTIONAL ACTIVITIES:

1. Have students define and give examples of the following:
   a) Water Transportation
   b) Liner Service
   c) Sea Lane
   d) Inland Shipping
   e) Barge
   f) LASH (Lighter Aboard Ship)
2. Discuss the different ship configurations and how each is particularly suited for transporting passengers and/or cargo.
3. Explain the difference between tramp and liner service.
4. Explain the difference between containerships and break-bulk ships.
5. Using a map of the United States, locate and trace the inland waterway system.
6. Discuss the importance of efficient terminals to a vessel.
7. List the main uses of the following vessels:
   a) Luxury Liner b) Barge
   c) Tow Boat d) Tug Boat
   e) Lash f) Break-bulk Ship
   g) Super Tankers h) Containerships
   i) Submarines j) Sea Bee Ships
   k) Alaska-hydro Train
8. Build model barges and float in a student made canal.
9. Check model barges for buoyancy, draft and volume.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. build a model of a canal with operational locks.
2. Build a working model air boat.
3. Conduct a concrete boat building contest to specifications provided by the teacher.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Large Water Container (split 6" PVC pipe)
Materials as needed for barge construction
Materials as needed to make various model small boats
Fish Tank Pump
Small Model Boat
Springs
Valves
Sealants

MATERIALS/CORE:

Map of the United States
5 lb. Sand

TOOLS AND EQUIPMENT/ADVANCED:

Same as Core

MATERIALS/ADVANCED:

6" Diameter PVC Pipe
Polyethylene Sheet
Silicon Sealing Caulk
Plexiglass
Tubing
Concrete

APPLICATION OF TERMS:

Barge
Break-bulk Ship
Containership
Cruise Ship
Deck
Hatch
Hold
Inland Shipping
LASH
Lighter
Liner Service
Port
Sea Bee
Sea-lane
Tanker
Terminal
Tow
Towboat
Tugboat
Vessel

REFERENCES:

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight, 1986. (To include Instructor's Guide.)

Hacker, Michael, and Barden, Robert, Technology In Your World, Albany, NY: Delmar Publishers, Inc., 1987.

REFERENCE: 5.5

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Pipeline

MAJOR CONCEPT: Pipeline transportation is the movement of cargo through a tube or pipe.

TOPICS:

1. Features and Benefits
2. Pipeline Types
3. Materials Transported Through Pipelines

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define pipeline transportation.
2. List and explain four characteristics of pipelines (1. Cargo moves, vehicle stands still, 2. Visually buried, 3. Laid out in straight line to decrease travel time, 4. Theft is difficult).
3. Explain how a pipeline can be shared by more than one shipper.
4. Identify the three basic types of pipeline (Gathering, Transmission and Distribution).
5. Explain how cargo is kept moving at a steady pace through the pipelines (Pumps and Control Stations).
6. Name three types of products which are transported through the pipelines (Gasoline, Diesel, Kerosene, Coal and Natural Gas, Wood Chips, Sulfur, Crude Oil).
7. Identify materials that make pipelines (Plastic or Steel).
8. Explain methods used to prevent pipelines from clogging (Cleaning brush called a pig).

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the efficiency, advantages, and disadvantages of pipeline transportation compared with moving cargo by other modes.
2. Using a map, trace crude oil as it travels from the fields of Alaska to the refineries on the west coast of the United States.
3. Research companies in your area that transport cargo through pipelines and how much they charge for their service. (Transportation cost is included in the rate charged to the customer.)
4. Construct a model pipeline using clear tubing and fittings and move some colored water through it.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Construct a model to illustrate the flow of gases, liquids and solids. (Use clear plastic tubing, fittings, pumps and syringes.)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Map of the United States
- Vacuum Cleaner

MATERIALS/CORE:

- Plastic Tubing
- Plastic Expandable Beads
- Tubing Clamps

TOOLS AND EQUIPMENT/ADVANCED:

- Aquarium Pump
- Vacuum Cleaner

MATERIALS/ADVANCED:

- Plastic Tubing
- Fittings
- Syringes
- Clamps

APPLICATION OF TERMS:

- Batch
- Control Station
- Measuring Station
- Transmission Pipeline
- Exchange Station
- Batch Sequence
- Mass
- Crossover Valves
- Distribution Pipeline
- Gathering Pipeline

REFERENCES:

Bohn, MacDonald, et al., *Energy, Power and Transportation Technology*, Encino, CA: Bennett and McKnight, 1986. (To include Instructor's Guide)

REFERENCE: 6.1

MAJOR TITLE: Engines

UNIT TITLE: Energy, Power and Transportation Technology

MAJOR CONCEPT: External combustion engines use heat energy and expanding gases produced outside the engine.

TOPICS:

1. History and Development of External Combustion Engines
2. Types of Motion Produced by Heat Engines (Reciprocating, Rotary, Linear)
3. Type of External Combustion Engines and How They Operate (Steam Reciprocating, Steam Turbine, Stiriling Cycle)
4. Power Theory and Efficiency

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Prepare a simple time line illustrating the development of the external combustion engines.
2. Match each type to external combustion engine with a diagram illustrating it and tell the type of motion it produces.
3. Calculate pressure/force problems using Force = Pressure X Area.
4. List reasons for loss of efficiency and ways to minimize losses.
5. Operate a model steam engine and discuss the principles involved.

CORE INSTRUCTIONAL ACTIVITIES:

1. Make models and discuss the operation of the following:
   a) A Uniflow Steam Engine
   b) A Reaction Turbine
   c) An Impulse Turbine
   See Reference Text (Chapter 16)
2. In two groups, research and report on the development of steam power and how it has affected the history of the world.
3. Bring in pictures illustrating uses of external combustion engines and make a bulletin board from the pictures.
4. Explain and discuss the principles of operation and application for the stiriling cycle engine.
5. Work several example problems on calculating force and discuss how force can be increased or decreased in an external combustion engine.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Construct a steam turbine (impulse or reaction).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Model Steam Engine   Cylinder Tank Burner

MATERIALS/CORE:
- Copper Tubing
- Various Fittings

TOOLS AND EQUIPMENT/ADVANCED:
None

MATERIALS/ADVANCED:
None

APPLICATION OF TERMS:
- Reciprocating
- Linear
- Reaction
- Expansion
- Captive
- Piston
- Cylinder
- Rotary
- Condense
- Impulse
- Compression
- Regenerator
- Multi-fuel
- Stiriling

REFERENCES:

Bohn, MacDonald, et al., *Energy, Power and Transportation Technology*, Encino, CA: Bennett and McKnight, 1986. (To include Instructor's Guide)

REFERENCE: 6.2

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Internal Combustion Engine

MAJOR CONCEPT: Internal combustion engines are engines in which the heat and pressure are produced inside the engine.

TOPICS:

1. Spark Ignition (S.I.)
2. Compression Ignition (C.I.)
3. Rocket Engine
4. Jet Engine

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Demonstrate how an internal combustion engine produces motion from burning fuel.
2. Demonstrate and explain what happens during each of the four strokes of a four-stroke engine.
3. Demonstrate and explain the operation of a two-stroke engine.
4. Identify advantages and disadvantages of the two-stroke engine as compared to the four-stroke engine.
5. Describe the primary differences between diesel and gasoline engines.
6. Explain how a diesel-electric engine combination operates.
7. Describe the operation of the Wankel/rotary engine in terms of the four-stroke engine.
8. State Newton's third law of motion and explain how it is used in jet and rocket propulsion.
9. Explain how turbojet, ramjet, turbofan, and turboprop engines work.

CORE INSTRUCTIONAL ACTIVITIES:

1. Using a cut-a-way model, show and explain the strokes of a two and a four cycle engine.
2. Using illustrations, models and charts, describe the difference between the operation of a gasoline and a diesel engine.
3. Explain Newton's third law of motion and how it applies to jet propulsion.
4. Demonstrate the direct motion of a Wankel engine using a wheel.
5. Construct and launch a single stage model rocket.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Construct and launch a multistage model rocket.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Model of a 4 Cycle Engine
- Model or Illustration of a Gasoline Engine
- Model or Illustration of a Diesel Engine
- Model or Illustration of a Wankel Engine
- Launching Pad
- Wheel - 4" Wagon Type
- Model of a 2 Cycle Engine

MATERIALS/CORE:

- Variety of Rocket Engines
- Rocket Kits
- Corks
- Balsa Wood
- Rocket Wadding
- Balloons
- Tape
- Solar Igniters

TOOLS AND EQUIPMENT/ADVANCED:

- Launching Pad
- Solar Igniters

MATERIALS/ADVANCED:

- Variety of Rocket Engines
- Rocket Kits
- Tape
- Rocket Wadding
- Corks
- Balsa Wood

APPLICATION OF TERMS:

- Piston
- Diesel Engine
- Wankel Engine
- Turbojet Engine
- Turbofan Engine
- Ramjet Engine
- Internal Combustion
- Cycle
- Power Stroke
- Otto Cycle
- Ports
- Rotor
- Turbine
- Combustion Chambers
- Stroke
- Gasoline Engine
- Jet Engine
- Turbine Engine
- Rocket Engine
- Thrust
- Combustion
- Intake Stroke
- Compression Stroke
- Exhaust Stroke
- Crankcase
- Compression Ignition
- Locomotives

REFERENCES:

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight, 1986. (To include Instructor's Guide)

Estes Industries, P.O. Box 227, Penrose, CO 81204.

REFERENCE: 6.3

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Automotive Engines

MAJOR CONCEPT: There are over 100 million internal combustion automotive engines in the United States.

TOPICS:

1. Classification of Engines (Number of Cylinders, Cylinder Arrangement, Type of Valve System, Type of Fuel Used, Type of Cooling Systems)
2. Types of Engine Systems
    a) Mechanical Systems
    b) Cooling Systems
    c) Lubricating Systems
    d) Fuel Systems
    e) Exhaust Systems
    f) Ignition Systems
    g) Computer Control Systems

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Name and describe the systems of an automobile engine (Mechanical, Cooling, Lubricating, Fuel, Exhaust, and Ignition).
2. Describe how engines are classified.
3. Identify engine operating characteristics that can be computer controlled.
4. Identify and describe characteristics of alternative fuels.
5. Describe principle operating differences between fuel-injection and carburetion.
6. Perform basic tune-up procedures on an automobile engine.
7. Identify basic components of an automobile system.
8. Devise a checklist for preventative maintenance.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the advantages and disadvantages of a gasoline, diesel and rotary powered engine.
2. List and discuss alternative fuels found in your community.
3. Identify and discuss systems that can be controlled by a computer.
4. Explain the difference between fuel injection systems and carburetor systems.
5. Demonstrate the basic tune-up procedures for an automobile. (Differentiate between gasoline and diesel)
6. Using a tune-up guide, list all necessary information needed to tune up the family car.
7. Lead a discussion on factors which effect gas mileage. (Ex. aerodynamics, tires, acceleration, deceleration, etc.)

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Perform a complete tune-up on an automobile engine.
2. Write a five to six page research paper on the history of the automobile and its technological advantages.
3. Perform an oil and filter change on an automotive engine.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Model or Illustration of a Gasoline Engine
Model or Illustration of a Diesel Engine
Model or Illustration of a Rotary Engine
Automotive Tune-up Kit per State List
Timing Light
Dwell Meter

MATERIALS/CORE:

Spark Plugs
Ignition Points
Condenser

TOOLS AND EQUIPMENT/ADVANCED:

Automotive Tune-up Kit as per State Approved List
Oil Filter Wrench

MATERIALS/ADVANCED:

Same as Core
Motor Oil

APPLICATION OF TERMS:

Glow Plug
Gasohol
Compression Ration
Alternator
Fuel-injection Pump
Camshaft
Starter
Sensors
Ignition
Electrodes
Ground
Choke
Fuel Pump
Oil Pump
Valve
Methanol
Diesel
Cylinder
Ignition Coil
Carburetor
Flywheel
Motor
Timing
Rotor Cap
Condenser
Distributor
Idle Screw
Air Cool
Piston
Four-Stroke

REFERENCES:

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight, 1986. (To include Instructor's Guide)

Stephenson, George, Small Gasoline Engines, Albany, NY: Delmar Publishers, Inc., 1984.

REFERENCE: 6.4

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Small Internal Combustion Engines

MAJOR CONCEPT: A small engine is generally a one cylinder, air cooled, two or four stroke piston engine producing up to eight horse power and used on lawn mowers, portable generators, roto tillers, etc.

TOPICS:

1. Primary Mechanical Parts of a Small Engine
2. Operation-Theory
3. Safety
4. Maintenance

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify and describe six major systems of the small engine (mechanical, lubrication, cooling, fuel, ignition/starting and exhaust).
2. Identify and describe the function of each of the main parts of the mechanical system, including the crankcase, cylinder head, piston rings, connecting rod crankshaft, intake and exhaust valves, value springs and timing gears.
3. List four ways the lubrication system serves the engine.
4. Identify procedures necessary to protect an engine during short or long term storage.
5. Troubleshoot a malfunctioning engine.
6. Identify three conditions an engine requires for good operation (ignition, fuel and compression) and describe how to check each condition.
7. Complete a safety test on small engines.
8. Disassemble and reassemble a small engine.
9. Convert a conventional small engine to solid state ignition.
10. Adjust carburetor and governor to manual specifications.
11. Identify basic small engine repair tools.
12. Perform a tune-up on a conventional engine.

CORE INSTRUCTIONAL ACTIVITIES:

1. Using a,service manual and tools, troubleshoot a small engine and identify parts necessary to make a repair.
2. Using an owner's manual, follow the manufacturer's recommendations for pre/post season maintenance on a lawn mower engine.
3. Perform a tune-up on a small engine.
4. Using a chart, the students will take a two-stroke cycle and a four-stroke cycle and explain the theory of operation for each.
5. Name the components of a given small engine.
6. List and describe the functions of each of the major systems of a small engine.

7. Describe how lubrication cleans, seals, lubricates, and cools a small engine.
8. Identify and describe the function of a crankcase, cylinder, cylinder head, piston rings, connecting rods, crankshaft, intake valve/parts, exhaust valve/parts, valve springs, and timing gears.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Disassemble and reassemble a small engine (leave carburetor together and piston in place).
2. Observe a teacher demonstration on converting a conventional small engine to solid state ignition.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Basic Small Engine Tool Kit
1.4" Socket Wrench Set
Easy-out Set
Large Curved Jaw Pliers
Magnetron Ignition Tool
Wire Feeler Gauge
Point File
Funnel
Wall Mount Blade Balancer
Long Allen Wrench Set
Torque Wrench
Tap and Die Set
Adjustable Wrench Set
Seal Puller
Condenser Tool
Flat Feeler Gauge
Gasoline Can
Large 3 Jaw Gear Puller
Nut Driver Set
Oil Drain Pan

MATERIALS/CORE:

Motor Oil
Solvent
Hand Cleaner
Starting Fluid

TOOLS AND EQUIPMENT/ADVANCED:

Same as Core

MATERIALS/ADVANCED:

Same as Core

APPLICATION OF TERMS:

Timing Mark
Intake Valves/Parts
Two Stroke Cycle
Camshaft
Charging System
Crankshaft
Cylinder Head
Fuel Injection
Valve Springs
Air Vane
Connecting Rods
Piston Rods
Exhaust/Parts
Four Stroke Cycle
Cam
Carburetor
Cooling System
Cylinder Block
Electrical System
Fuel Pump
Mechanical Governor
Torque Wrench
Crankcase
Seal

- Lobes
- Piston
- Spark Plug
- Valve
- Mechanical Systems
- Fuel System
- Power Train
- Starting System
- Valve Train
- Lubrication Systems

REFERENCES:

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight, 1986. (To include Instructor's Guide)

Stephenson, George, Small Gasoline Engines, Albany, NY: Delmar Publishers, Inc., 1984.

NOTES

REFERENCE: 7.1

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Solar

MAJOR CONCEPT: Solar energy is energy received by the earth from the sun and has provided directly or indirectly, all of the sources of energy for the earth.

TOPICS:

1. Heating With Solar Energy
2. Electricity From Solar Energy

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain how solar energy is used to provide heat and electricity.
2. Describe how heat is moved by conduction, radiation, and convection.
3. Differentiate between a good insulator and a good conductor of heat energy.
4. Explain the difference between passive and active solar heating.
5. Explain the operation of a passive and solar heating system.
6. Explain the principle of thermosiphoning.
7. Explain the operation of an active solar heating system, including the operation of the collector, the heat storage unit, the distribution system, and the controls.
8. Describe how photovoltaic cells convert solar energy to electricity.
9. Identify two systems that might someday be used to capture solar energy in outer space for use on earth. (SOLARES-Space-Orbiting Light-Augmentation Reflector Energy System and SPS-Solar Powered Satellites)

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the advantages and disadvantages of passive versus active solar systems.
2. Demonstrate the principle of thermosiphoning.
3. Define photovoltaic cell and discuss its importance in the production of electricity.
4. Discuss the future applications of solar energy in outer space.
5. Experiment with various materials to determine if they are good insulators or conductors of heat.
6. Construct a solar heat collector and discuss the operation of an active solar heating system. (Heat Collector employing a heat exchanger.)
7. Construct a solar battery. (See Reference)
8. Construct and use a sun target. (See Reference)
9. Construct a mirrored dish collector with focal point for roasting hot dogs or measuring temperature.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Construct and experiment with model solar projects such as solar powered cars, boats, and other motorized projects.

2. Build a solar water purification system.
3. Use solar trainer to conduct various experiments.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

PVC Pipe and Fittings
Solar Collector
Thermometer
Aluminum Flashing
Fan
Storage Tanks
Insulating Materials
Mirrored Dish
Photovoltaic Cells

MATERIALS/CORE:

Aluminum Can and Sheets
See Activity Guide

TOOLS AND EQUIPMENT/ADVANCED:

Solar Experimenter Kits
Wheels
Axles
Solar Cells
Gears
Solar Trainer

MATERIALS/ADVANCED:

None

APPLICATION OF TERMS:

Conduction
Radiation
Heat Loss
Passive Systems
Thermal Collector
Indirect-gain
Thermosiphoning
Solar Panel
Frame
Insulation
Tubing
Transparent
Backup (Heating System)
Radiant Heaters
Photovoltaic System
Congeneration
Orbiting Mirrors
Energy System
Light Augmentation Reflector
Convection
Convection Current
Active Systems
Direct-gain
Overhand
Thermal Loss
Solar Collector
Greenhouse Effect
Density
Heat Absorber
Glazing
Translucent
Heat Exchanger
Change Over Valve
Photons
Heat Pump
SOLARES/Space-Orbiting
Microwaves
Solar Sailing

REFERENCES:

Bohn, MacDonald, et al., *Energy, Power and Transportation Technology*, Encino, CA: Bennett and McKnight, 1986. (To include Instructor's Guide)

REFERENCE: 7.2

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Nuclear

MAJOR CONCEPT: Nuclear energy is the energy released when matter is changed into energy.

TOPICS:

1. Origin and Use of Nuclear Power
   - The Atom (Atomic Structure)
2. Nuclear Reaction
   - Nuclear Fission
   - Nuclear Fusion
3. Nuclear Auxiliary Power
4. Impact on Environment

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain the origins and physical characteristics of nuclear energy and how it is used in our lives.
2. Explain the two types of nuclear reactions.
3. Classify and compare the uses of the nuclear auxiliary power devices.
4. Explain how a nuclear power plant creates electricity from atomic energy.

CORE INSTRUCTIONAL ACTIVITIES:

1. Construct a collage showing various uses of nuclear power and draw the structure of an atom.
2. Draw a diagram of what occurs during each type of nuclear reaction. Show sequences of occurrences and physical properties/facilities (i.e. fuels, nuclear plants, reactors, etc.).
3. Discuss the types of nuclear auxiliary power and explain their benefits. Compare the advantages and disadvantages of each (nuclear battery, thermoelectric, coupling).
4. Discuss the hazards of nuclear power.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Construct a model of a nuclear reactor.
2. Using the solar collector constructed in Activity 7-1, demonstrate the primary and secondary system used in a nuclear reactor.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

Current Magazine Articles

TOOLS AND EQUIPMENT/ADVANCED:

As needed to construct a model Solar Collector

MATERIALS/ADVANCED:

As needed according to model design

APPLICATION OF TERMS:

Fission
Plutonium
Deuterium Oxide
Radiation
Fuel Rods
Nuclear Wastes
Fusion Reaction
Plasma
Laser
Thermocouple
Isotopes
Megawatts
Nuclear Plant
Nuclear Fusion
Fusion
Pellet
Uranium
Reactor
Heat Exchanger
Tritium
Lithium
Tokamak
Beta Particle
Helium
Nucleus
Nuclear Battery
Core
Pressurized-Water Reactors

REFERENCES:

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight, 1986.

REFERENCE: 7.3

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Space Exploration

MAJOR CONCEPT: Space can be explored due to our technical knowledge of space vehicles and propulsion systems.

TOPICS:

1. Types of Space Vehicles
2. Types of Propulsion Systems
3. Applications of Space Vehicles and Propulsion Systems
4. Impact on Society and Environment

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Recognize the types of power sources, propulsion control and guidance systems used in space crafts.
2. Discuss the role that space shuttles have in transporting people and goods.
3. Identify contributions that space exploration has made and will make in the technologies of production, communication, energy utilization and the impact of these upon society and the environment.
4. Identify the various manned and unmanned spacecraft and their uses throughout the history of space flight.
5. Demonstrate imagination and creativity concerning the future of space travel and colonization through written assignments, designing and model building.
6. Demonstrate proper safety precautions in working with model rockets.

CORE INSTRUCTIONAL ACTIVITIES:

1. Design and build a model spacecraft to be powered by a purchased engine.
2. Test stability of a model rocket by using a string to simulate flying. (Use rockets constructed in section 6-2.)
3. Make a time line of spacecrafts showing the name, date, and use of each and display it in the school.
4. Design a space station/colony, spacecraft, and/or satellite model.
5. Identify reasons for the use of manned and unmanned spacecraft through class.
6. Discuss possible uses for space shuttles in space exploration.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Experiment with various sizes of rocket engines to determine thrust. (Use a holding fixture and weight scale. Record the thrust in pounds.)
2. Construct very small models of satellites and attach to a globe to represent a geo-synchronous orbit.
3. Launch a multistage model rocket with a payload. (Camera Equipped Rocket)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

As needed in construction of model spacecraft
Launch Pad
Ignition System

MATERIALS/CORE:

As needed for construction of model spacecraft

TOOLS AND EQUIPMENT/ADVANCED:

As needed for construction of model spacecraft
Launch Pad
Payload
Ignition System
Globe

MATERIALS/ADVANCED:

As needed for construction of model spacecraft

APPLICATION OF TERMS:

Gyro-stabilizers
Transporter
Orbiter
Space Travel
Meteorological
Multistaging
Orbit
Oxidizer
Propellants
Sputnik
Space Staging
Robot
Defense
Launch
Velocity
Fuel
Lander
Sensing
Combustion
Satellites
Synchronous Orbit
Space Mirrors
Microwaves
Mining
Radar
Voyager
Geological
Propulsion

REFERENCES:

See additional references attached.

REFERENCE: 7.4

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Emerging Systems

MAJOR CONCEPT: Technology and transportation systems are ever changing and improving to meet the demands of society.

TOPICS:

1. Advancing Technology (Lasers, Cryogenics, Fuel Cells, Composite Materials, Super Conductors)
2. Advanced Utilization of Energy Sources
3. Advances in Transportation (Rail, Highway, Air, Space, Water)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define and explain uses of cryogenics, laser, fuel cell, composite materials, and super conductors.
2. Identify and recognize emerging technologies.
3. Identify and recognize emerging improvements in the transportation systems.

CORE INSTRUCTIONAL ACTIVITIES:

1. Design a "perpetual motion machine." Compete with class members to see who can make theirs run the longest.
2. Bring in articles for advancing technologies to share with the class.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Conduct experiments using the Laser trainer as specified in the State Equipment list.
2. Construct a Magnetic Levitation Train. (Activity No. 11 - Activity Guide)
3. Write a report on how technology and transportation will "affect my life in the future."
4. Using a microwave oven and a thermometer, heat various materials of the same mass for a predetermined time and record temperatures. (Wood, Plastic, Water)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

Laser Trainer as specified in the State Equipment List
Microwave Oven
Thermometer

MATERIALS/ADVANCED:

None

APPLICATION OF TERMS:

- Fiber Optics
- Holography
- Ruby Laser
- Levitate
- Oxidizer
- Superconductor
- Fuel Cells
- Laser
- Electrolyte
- Hydrogen
- Fuel

REFERENCES:

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight, 1986. (Including Activity Guide)

REFERENCE: 8.1

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Careers in Power/Transportation

MAJOR CONCEPT: Exciting careers await you in power and transportation services, manufacturing, and research.

TOPICS:

1. Career Types (Production, Mechanic, Technician, Technologist, Engineer, Etc.)
2. Choosing a Career In Power/Transportation
3. Sources of Career Information (Occupational Outlook Handbook, SCOIS)
4. Individual Career Needs (Abilities, Interests, Value of Oneself, and Education)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Discuss how knowledge of one's interests, aptitude, and abilities is important when choosing a career.
2. Identify a variety of places where information about careers can be obtained.
3. Identify and describe five common career areas (production mechanic, technician, technologist, and engineer).
4. Develop a training plan to meet the entry-level requirements for a chosen career.

CORE INSTRUCTIONAL ACTIVITIES:

1. Class visit by Guidance Counselor
    a) Interest inventory
    b) Manual battery test
2. Define five common career areas in the field of power and transportation.
3. Compare test results from #1 above with job requirements of a particular career.
4. Use South Carolina Occupational Information System (SCOIS) to get information on careers.
5. Go through the career choice steps (self-analysis and knowledge of careers).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Write a report concerning a particular power/transportation career.
2. Interview people from various occupations in the power/technology area.
3. Map the educational path to obtaining a job in the following power/transportation fields: truck driver, heating and air conditioning specialist, electrician, vehicle designer, and energy researcher.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer SCOIS Access

MATERIALS/CORE:

Trade and Technical Careers Handbook

TOOLS AND EQUIPMENT/ADVANCED:

None

MATERIALS/ADVANCED:

None

APPLICATION OF TERMS:

None

REFERENCES:

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight, 1986.

Department of Transportation, Columbia, SC 29201.

Junior and Senior Level College Catalogs.

Career Center Course Descriptions.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY
Suggested Equipment List

Lever Demonstration Kit
Bicycle
Hand Pump
Small Pin Wheel
VOM Meter
Torque Wrench
Hot Plate
Thermometer
Fish Bowl
Broderbaund Science Tool Kit (Software)
Computer
Hydraulic Jack
Generator
Heat Lamp
Robotic Arm
Model Train Set
Motorized Fan
Spring or Postage Scale
Model Steam Engine
Wankel Engine Model
4 Cycle Engine Model
Timing Light
Condenser Tool
Gear Puller
Easy Out Set
Magnetron Ignition Tool
Funnel
Allen Wrenches
Photovoltaic Cell
Solar Experimenter Kit
Solar Trainer
Globe
Microwave Oven
AC/DC Power Source
Model Car w/Moveable Axles
Aquarium Pump
Solar Cells
Tea Kettle
Air Compressor
Dynamometer
Hydraulic Pump
Stop Watch
Light Meter
Car Jack
Barometer
Robot Kits
Hypodermic Syringes
Computer Interface
Mechanical Trainer
Model Truck
Vacuum Cleaner
Model Rocket Launch Kit
Propane Burner
2 Cycle Engine Model
Model Gasoline Engine
Automotive Tune Up Kit
Nut Driver Set
Oil Drain Pan
Wire Feeler Gauge
Basic Small Engine Tool Kit
Blade Balancer
Storage Tank
Gears
Mirrored Dish
Solar Collector
Laser Trainer
SCOIS Access

ENERGY, POWER, AND TRANSPORTATION TECHNOLOGY

STANDARD TOOL LIST

Pliers
Gasoline Can
Scissors
Screwdriver
Files
Soldering Gun
Bar and "C" Clamps
Brace and Bit
Backsaw
Volt/Ohm Meter
Tin Snips
Gloves
Ruler
Try Square
Chipping Hammer
Level
Nail Set
Router and Bits
Broom
Scratch Awl
Safety Glasses
Chisels (Wood and Cold)
Slip Joint Pliers
Claw Hammer
Ball Peen Hammer
Table Saw
Belt and Disk Sander
Electric Hand Drill
Point File
Adjustable Wrench
Handsaw
Surform Tool
Blockplane
Vice
Needlenose Pliers
Coping Saw
Compass Saw
Wire Cutters
Vice Grips
Welding Hood
Framing Square
Combination Square
Mallet
Sliding T-Bevel
Punch
AC/DC Welder
Drill Bits
Putty Knife
Safety Shield
Hacksaw
Craft Knife
Combination Wrench Set
Drill Press
Band Saw
Scroll Saw
Bench Grinder

RESOURCES

RESOURCE LIST

This list represents possible sources of items from independent concessionaires and entrepreneurs, not available from the Nation Aeronautics and Space Administration, and is offered without recommendation or endorsement by NASA. Inquiry should be made directly to the appropriate source to determine availability, price, and time required to fill orders before sending money.

SCIENTIFIC AND TECHNICAL INFORMATION (MISSION REPORTS):

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22151

Scientific and Technical Information Facility
800 Elkridge Landing Road
Linthcum Heights, Maryland 21090

SPACECRAFT AND AIRPLANE MODELS:

Models of spacecraft and aircraft may be purchased at hobby shops and toy departments of your local department stores, and also at some of the companies listed below. The following firms are model-rocket manufacturers:

Estes Industries, P.O. Box 227, Penrose, CO 81240
Revell, Inc., 4288 Glencoe Avenue, Venice, CA 90291
Centum Engineering Co., P.O. Box 1988, Phoenix, AZ 85001
Fight Systems, Inc., 9300 East 68th Street, Raytown, MO 64133
Pacific Miniatures, Inc., Morton Grove, IL 60053

SOUVENIRS AND MEMORABILIA COMMEMORATING SPACE, SUCH AS CAMERAS, TEXTBOOKS, PHOTOGRAPH ALBUMS, EMBLEMS, PATCHES, COMMEMORATIVE MEDALS, FLIGHT JACKETS, T-SHIRTS, CAPS, BUTTONS, ETC.:

AW/JSC Exchange Store, Johnson Space Center, Houston, TX 77058
Alabama Space and Rocket Center, Tranquility Base, Huntsville, AL 35807
Space Age Enterprises, P.O. Box 58127, Houston, TX 77058
National Medallion Company, Inc., P.O. Box 58127, Houston, TX 77058
KSC Tours, TWA Services, Inc., TWA-810, Kennedy Space Center, FL 32935
Communications Association Corp., 250 Babcock Street, Melbourne, FL 32935
Visitor Information Center, Gift Shop, Johnson Space Center, Houston, TX 77058
Smithsonian Institute Museum Shops, 900 Jefferson Drive SW, Washington, DC 20560
NASA/Headquarters Exchange Store, 600 Maryland Ave., SW, Washington, DC 20546

SPACE SUITS:

ILC-Dover, Box 266, Fredenca, DE 19946
Hamilton Standard, Windsor Locks, CT 06096

STAMPS:

JSC Stamp Club, P.O. Box 58328, Houston TX 77058

Houston Hobby Center, P.O. Box 10791, Houston, TX 77018

MAPS: MOON, MARS, ETC.:

Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402
National Geographic Society, P.O. Box 2806, Washington, DC 20036

PHOTOGRAPHS, SLIDES, ETC.:

AW/JSC Exchange Store, Johnson Space Center, Houston, TX 77058
Astronomical Society of the Pacific, 1290 24th Avenue, San Francisco, CA 94122
Woodstock Products, Inc., P.O. Box 2519, Beverly Hills, CA 90213

8MM AND 16MM NASA FILMS:

National Audio Visual Center (GSA), Washington, DC 20409

SPACE-TYPE FREEZE-DEHYDRATED FOODS:

Oregon Freeze-Dry Foods, Inc., P.O. Box 1048, Albany, OR 97321
Sam-Andy Foods, P.O. Box 1120, Colton, CA 92324
Freeze Dry Products, 321 Eighth Street, NW, Evansville, IN 47708
G. Armanino & Sons, Inc., 1970 Carroll Avenue, San Francisco, CA 94124
Right-A-Way Foods, P.O. Box 184, Edinburg, TX 78539
Spaceland Enterprises, P.O. Box 775, Merritt Island, FL 32952

SOLAR SYSTEMS INFORMATION, CHART, ETC.:

The Hansen Planetarium, Department F, 1098 South 200 West, Salt Lake City, UT 84101
Smithsonian Astrophysical Observatory, 60 Garden Street, Cambridge, MA 02138
Astronomical Society of the Pacific, 1290 24th Avenue, San Francisco, CA 94122

SPECIAL SOURCES:

Abstracts of technical reports on imagery from Earth Resources Satellites (LANDSAT) funded by NASA, prepared and distributed by National Technical Service of Department of Commerce as a weekly bulletin; abstracts on NASA-owned inventions available for licensing:

U.S. Department of Commerce
National Technical Information Service
Springfield, VA 22161

LANDSAT (formerly known as "ERTS") photographs available to persons and groups not qualified as LANDSAT principal investigators to receive pictures directly from NASA: costs range from $1.25 for a 70mm black and white contact print to $27 for a 40 x 40 inch color transparency.

Technology Applications Center University of New Mexico Albuquerque, NM 87106	specializes in remote sensing technology

EROS Data Center
Department of Interior
10th & Dakota Avenue
Sioux, Falls, SD 57198

LANDSAT and Skylab imagery, and NASA aircraft data

National Oceanic and Atmospheric Administration
Department of Commerce
EROS Data Center
Suitland, MD 20023

data in oceanographic hydrologic, and atmospheric sciences

National Climatic Center
NOAA Environmental Data Services
Federal Building
Asheville, NC 28801

Western Aerial Photograph Laboratory
Agricultural Stabilization & Conservation Service
U.S. Department of Agriculture
2505 Parley's Way
Salt Lake City, UT 84109

agriculture imagery and data

SPACE CAMP INFORMATION:

Alabama Space & Rocket Center
Space Camp Applications
Tranquility Base
Huntsville, AL 35807

POWER FACTORY CONTROLLER DISTRIBUTOR

Energy Vent, Inc.
915 Valley Street
Dayton, OH 45404

NASA EDUCATION OFFICES:

NASA publications should be ordered from the Superintendent of Documents, Government Printing Office. Other inquires may be directed to the Educational Office at the NASA Center which is designated to serve your state as indicated in the list below.

If you live in:		Write to Education Office of:
Alaska Arizona California Hawaii Idaho Montana	Nevada Oregon Utah Washington Wyoming	NASA Ames Research Center Monen Field, California 94035
Connecticut Delaware District of Columbia Maine Massachusetts New Jersey	Pennsylvania Vermont Rhode Island Maryland New Hampshire New York	NASA Goddard Space Flight Center Greenbelt, Maryland 20771

If you live in:	Write to Education Office of:
Colorado Kansas Nebraska North Dakota South Dakota New Mexico Oklahoma Texas	NASA Lyndon B. Johnson Space Center Houston, Texas 77058
Florida Georgia Puerto Rico Virgin Islands	NASA John F. Kennedy Space Center Kennedy Space Center Florida 32899
Kentucky North Carolina South Carolina Virginia West Virginia	NASA Langley Research Center Langley Station Hampton, Virginia 23665
Illinois Indiana Michigan Minnesota Ohio Wisconsin	NASA Lewis Research Center 21000 Brookpark Road Cleveland, Ohio 44135
Alabama Arkansas Iowa Louisiana Mississippi Missouri Tennessee	NASA George C. Marshall Space Flight Center Marshall Space Flight Center Alabama, 35812

ENGINEERING

Engineers Council for Professional Development, 345 East 47th Street, New York, NY 10017. The following guidance materials are available from ECPD. Single copies (except where noted) will be sent to students and counselors:

After High School--What (EC-13) 1969
Do I have Engineering Aptitude (EC-14) 1969
Guidance Counselor Kit (EC-19) 1973 S4
Engineering: Creating A Better World (EC-62) 1970
New Careers in Engineering Technology (EC-63) 1970
Make Your Career Choice Engineering (EC-68) 1974
The Engineering Team (EC-69) 1974
Engineering Career Series (EC-70) 1973
Minorities in Engineering (EC-71) 1974
Accredited Curricula Leading to Degrees in Engineering (EC-20) 1972
List of Accredited Curricula Leading to Degrees in Engineering
    Technology (EC-21) 1972

Industrial Engineering, The Professional With a Future, The American Institute of Industrial Engineers, Inc., 25 Technology Park, Atlanta, GA 30071 (1974)

Manufacturing Engineering, A Rewarding Career, The Society of Manufacturing Engineering Engineers, 20501 Ford Road, Dearborn, MI 48128 (1974)

Mechanical Engineering, The American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, NY 10006 (1973)

The Metallurgical Engineering Technician, American Society for Metals, Metals Park, OH 44073 (1972)

Road to Graduate School In Engineering, American Society of Engineering Education, One Dupont Circle, Suite 400, Washington, DC 20036, Revised periodically, 50¢

Science and Engineering Careers - A Bibliography, 7th Edition, Scientific Manpower Commission, American Academy for the Advancement of Science, 1776 Massachusetts Avenue, NW, Washington, DC 20036 (1974), $2

Team 'work', American Institute of Industrial Engineers, Inc., United Engineering Center, 345 East 47th Street, New York, NY 10017 (1972)

The Certification of Engineering Technicians, Institute for the Certification of Engineering Technicians, 2029 K Street, NW, Washington, DC 20006 (1974)

The Engineering Technician, American Society for Engineering Education, Suite 400, One Dupont Circle, Washington, DC 20036 (1970)

The Future Belongs to the Chemical Engineer, American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017 (1973)

The Jets Program, The Junior Engineering Technical Society, United Engineering Center, 345 East 47th Street, New York, NY 10017

Women in Engineering Careers, Society of Women Engineers, United Engineering Center, Room 305, 345 East 47th Street, New York, NY 10017 (1970)

Your Challenge in Electrical Engineering, Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NY 10017 (1972)

An Introduction to Die Casting, The Society of Die Casting Engineers, 14530 West 8 Mile Road, Detroit, MI 48237, (1970)

Careers in Metallurgy, Materials Science, and Metallurgical Engineering, The Metallurgical Society of AIME, 345 East 47th Street, New York, NY 10017, (1974)

Careers in Quality, American Society for Quality Control, 161 West Wisconsin Avenue, Milwaukee, WI 53203, (1974)

Directory of Colleges and Universities offering Photography Instruction, Professional Photographers of America, 1090 Executive Way, Oak Leaf Commons, Des Plaines, IL 60018, (1974)

Directory of Transportation Education, National Defense Transportation Association, 1612 K Street, NW, Washington, DC 20006, (1972)

Education for Technical Writers, Society for Technical Communication, Suite 421, 1010 Vermont Avenue, NW, Washington, DC 20005, (1970)

Focus on the Future, Professional Photographers of America, 1090 Executive Way, Oak Leaf Commons, Des Plaines, IL 60018, (1972)

Is Technical Writing Your Career?, Society for Technical Communication, Suite 421, 1010 Vermont Avenue, NW, Washington, DC 20005, (1971)

Machine Tools/American Muscles, National Machine Tool Builders, 2139 Wisconsin Avenue, NW, Washington, DC 20007, (1969)

Measurement and Control Industry, Scientific Apparatus Makers Association, 370 Lexington Avenue, New York, NY 10017, (1972)

Planning a Career in Electronics, Electronic Industries Association, 2001 "I" Street, NW, Washington, DC 20006, (1971)

Your Introduction to Photogrammetry, The American Society of Photogrammetry, 105 N. Virginia Avenue, Falls Church, VA 22046, (1973)

Your Career in Fluid Power, The Fluid Power Society (FPS), 432 East Kibourn Avenue, Milwaukee, WI 53201, (1973) A Bright Future For You as a Chemical Technician, Manufacturing Chemists Association, 1825 Connecticut Avenue, NW, Washington, DC 20009, (1972)

A Career in Astronomy, American Astronomical Society, 211 Fitz Randolph Road, Princeton, NJ 08540, (1972)

A Career in Ecology, Ecological Society of America, Department of Botany, University of North Carolina, Chapel Hill, NC 27514, (1972)

A Career in Metallurgy Will Extend Your Reach, Career Development Office, American Society for Metals, Metals Park, OH 44073, (1970)

Accredited Curricula in Chemical Engineering, American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017, (1973)

Biological Photograph - A Challenging Profession, Biological Photographic Association, Box 1057, Rochester, MN 55901, (1973)

Agricultural Careers in Science, Business and Education, Ak-Sar-Ben-Ag Youth Foundation, 110-C Information, College of Agriculture, University of Nebraska, Lincoln, NE 68053, (1974), 25¢

Careers in Biology, American Institute of Biological Sciences, 3900 Wisconsin Avenue, NW, Washington, DC 20016, (1971)

Careers Ahead in the Chemical Industry, Manufacturing Chemists Association, 1825 Connecticut Avenue, NW, Washington, DC 20009, (1971)

Careers in Exploration Geophysics, Society of Exploration Geophysics, Box 3098, Tulsa, OK 74101, (1971)

Careers in Statistics, Committee of Presidents of Statistical Societies, American Statistical Association, 806 15th Street, NW, Washington, DC 20005

Career Opportunities in Metallurgy, Office of Career Development, American Society of Metals, Metals Park, OH 44073, (1970)

Chemistry and Your Career, American Chemical Society, 1155 16th Street, NW, Washington, DC 20036, (1970)

Curricula in the Atmospheric Sciences, The American Meteorological Society, 45 Beason Street, Boston, MA 02108, Revised periodically, ($4)

Directory of Geoscience Departments, American Geological Institute, 2001 M Street, NW, Washington, DC 20037, Revised periodically, ($4)

Documentary Research for Environment/Ecology Education (E/EE) - A Bibliography, Institute of Environmental Sciences, 940 East Northwest Highway, Mt. Prospect, IL 60056, $1.50, (1972)

Environmental Health Programs, Graduate Level, National Environmental Health Association, 1600 Pennsylvania Street, Denver, CO 80203, (1971) Environmental Health Technician, National Environmental Health Association, 1800 Pennsylvania Street, Denver, CO 80203, (1971)

Environmental Programs in Two Year Colleges, National Environmental Health Association, 1600 Pennsylvania Street, Denver, CO 80203, (1971)

Geology - Science and Profession, American Geological Institute, 2201 M Street, NW, Washington, DC 20037, 35¢, (1970)

Geophysics, The Earth in Space, American Geophysical Union, 2100 Pennsylvania Avenue, NW, Washington, DC 20037, (1972)

Guidebook to Departments in the Mathematical Sciences, The Mathematical Association of America, 1225 Connecticut Avenue, NW, Washington, DC 20036, Revised periodically, ($1)

How About a Career In Mathematics, The Mathematical Association of America, 1225 Connecticut Avenue, NW, Washington, DC 20036, (1972)

Keys to Careers in Science and Technology, National Science Teachers Association, 1742 Connecticut Avenue, NW, Washington, DC 20009, (1973), $1

Microbiology in Your Future, American Society for Microbiology, 1913 "I" Street, NW, Washington, DC 20006, (1974)

Oceanography Information Kit, National Oceanography Association, 1900 L Street, NW, Washington, DC 20036, 1972, ($2)

Physics as a Career, American Institute of Physics, 335 East 45th Street, New York, NY 10017, (1970)

Post-Secondary Curriculums in Environmental Technology, National Sanitation Foundation, Box 1468, Ann Arbor, MI 48106, (1971)

Preparing for a Career in Oceanography, Scripps Information of Oceanography, P.O. Box 109, La Jolla, CA 92037

Programs of Training and Education in Environmental Technology, National Sanitation Foundation, Box 1468, Ann Arbor, MI 48106, (1972)

Science and Engineering Careers, Scientific Manpower Commission, American Association for the Advancement of Science, 1776 Massachusetts Avenue, NW, Washington, DC 20036, (1974)

Test Yourself in Science, Scientific Manpower Commission, American Academy for the Advancement of Science, 1776 Massachusetts Avenue, NW, Washington, DC 20036, (1971) $1

The Challenge of Meteorology, The American Meteorological Society, 45 Beacon Street, Boston, MA 02108, (1971)

The Environmentalist, National Environmental Health Association, 1600 Pennsylvania Street, Denver, CO 80203, (1973) The Sphere of the Geological Scientist, American Geological Institute, 2001 M Street, NW, Washington, DC 20037, (1970)

Undergraduate Environmental Health Curricula, National Environmental Health Association, 1600 Pennsylvania Street, Denver, CO 80203, (1971)

You'll Need Math, The Mathematical Association of America, 1225 Connecticut Avenue, NW, Washington, DC 20036, (1971)

ADDITIONAL SOURCES OF INFORMATION

Engineering Manpower Commission, 345 East 47th Street, New York, NY 10017
National Aerospace Education Association, Shoreham Building, 806 15th Street, NW, Washington, DC 20005
Federation of Americans Supporting Science and Technology, 1785 Massachusetts Avenue, NW, Washington, DC 20036
National Aeronautic Association, Room 610, 806-15th Street, NW, Washington, DC 20005
Aerospace Youth Council, 1785 Massachusetts Avenue, NW, Washington, DC 20036
Aerospace Education Foundation, 1750 Pennsylvania Avenue, NW, Washington, DC 20006
Aviation Technician Education Council, P.O. Box 51133, Tulsa, OK 74151
Aviation Distributors and Manufacturers Association, 1900 Arch Street, Philadelphia, PA 19103

GOVERNMENT SOURCES

National Aeronautics and Space Administration Educational Publications, NASA, Washington, DC 20546, (1974)

NASA Film List, National Aeronautics and Space Administrator, Washington, DC 20546, (1973)

Occupational Outlook Reprint Services, U.S. Department of Labor, Bureau of Labor Statistics, Washington, DC 20402

Aircraft, Missile and Spacecraft, #123, 25¢
Civil Aviation, #138, 35¢
Engineers, #63, 30¢
Environmental Scientists, #64, 30¢
Physical Scientists, #67, 30¢
Technicians, #68, 30¢

Federal Careers for Technicians in Engineering and Physical Science, U.S. Civil Science Commission, 1900 E Street, NW, Washington, DC 20415, (1972)

Career Materials, Department of Transportation, Federal Aviation Administration, Office of Information Services, Public Information Center, 800 Independence Avenue, SW, Washington, DC 20591

Learning About Space Careers, NASA, U.S. Government Printing Office, #EP-32, Washington, DC, 25¢

Air Traffic Controllers - Special Breed, Federal Aviation Administration, Washington National Airport, Washington, DC 20001 (1971)

25 Technical Careers You Can Learn in Two Years or Less, Career, U.S. Department of HEW, Office of Education, Washington, DC 20202

Careers for Women as Technicians, U.S. Department of Labor, Women's Bureau, Washington, DC 20210

Career Education in the Environment - A Handbook, Superintendent of Documents, Government Printing Office, Washington, DC 20402, 1780-0892, 1972, (S3)

PUBLISHERS

Listed below are the publishers who have responded to a request for materials relating to careers in aerospace. The scope and format of the information varies from company to company. It is suggested that interested parties write to these firms for a listing of career materials.

Alumnae Advisory Center, 541 Madison Avenue, New York, NY 10022

B'nai B'rith Career and Employment Services. 1640 Rhode Island Avenue, NW, Washington, DC 20036

Careers, Inc., Box 135, Largo, FL 33540

Chronicle Guidance Publications, Inc., Moravia, NY 13118

Dodd, Mead, and Company, 79 Madison Avenue, New York, NY 10016

J. G. Ferguson Publishing Company, 6 North Michigan Avenue, Chicago, IL 60602

Julian Messner, 1 West 39th Street, New York, NY 10018

William Morrow & Company/Lathrop Lee and Shepard, 105 Madison Avenue, New York, NY 10016

Richards Rosen Press, Inc., 29 East 21st Street, New York, NY 10016

Science Research Associates, Inc., 259 East Erie Street, Chicago, IL 60611

Vocational Guidance Manuals, 620 South Fifth Street, Louisville, KY 40202

BUSINESS AND INDUSTRIAL SOURCES

Can I Be a Technician? Let's Find Out, Public Relations Staff, General Motors Corporation, Detroit, MI 48202

Can I Be an Engineer? Public Relations Staff, General Motors Corporation, Detroit, MI 48202, (1972)

Can I Be a Craftsman? Public Relations Staff, General Motors Corporations, Detroit, MI 48202

What's It Like to Be a Engineer? Education Relations, General Electric Company, Ossining, NY 10562, (1972)

What's It Like to Be a Technician? Education Relations, General Electric Company, Ossining, NY 10562, (1972)

Aerospace Education, Aero Products Research, Inc., 11201 Hindry Avenue, Los Angeles, CA 90045

Piper Air Science Education and College in the Clouds, Aero Products Research, Inc., 11201 Hindry Avenue, Los Angeles, CA 90045

Sperry's There and It's a Cold Cruel World, Sperry Flight Systems, P.O. Box 2111, Phoenix, AZ 85036

Your Future at Grumman, Grumman Aerospace Corporation, Bethpage, NY 11714

Your Career in the World of Bendix, Bendix Corporation, Bendix Center, Southfield, MI 48076

It's Your Turn, Fairchild Industries, 20301 Century Blvd., Germantown, MD 20767

Tech-Notes, Singer Company, Kearfott Division, 1150 McBride Avenue, Little Falls, NJ 07424

Blueprint for Future, Vought Systems Division - LTV Aerospace Corporation, P.O. Box 5907, Dallas, TX

Careers in Aerospace, The Boeing Company, P.O. Box 37073, MS 11-48, Seattle, WA 98124

Aviation Education Materials, Beech Aircraft Corporation, Education Department, Wichita, KS 67201

Aviation Education Programs, Cessna Aircraft Company, P.O. Box 1521, Wichita, KS 67201

Guidance personnel wishing to make use of NASA professional educators, publications, and/or audiovisual materials in their programs may contact the Educational Program Officer at the NASA Center serving their respective states. See below:

NASA Ames Research Center, Moffett Field, California 94035
Serving: Alaska, Arizona, California, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming

NASA Marshall Space Flight Center, Marshall Space Flight Center, Alabama 35812
Serving: Alabama, Arkansas, Iowa, Louisiana, Mississippi, Missouri, and Tennessee

NASA Goddard Space Flight Center, Greenbelt, Maryland 20771 Serving: Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont

NASA Johnson Space Center, Houston, Texas 77058 Serving: Colorado, Kansas, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, and Texas

NASA Kennedy Space Center, Kennedy Space Center, Florida 32899 Serving: Florida, Georgia, Puerto Rico, and Virgin Islands

NASA Langley Research Center, Langley Station, Hampton, Virginia 23365 Serving: Kentucky, North Carolina, South Carolina, Virginia, and West Virginia

NASA Lewis Research Center, 21000 Brookpark Road, Cleveland, Ohio 44135
Serving: Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin

This bibliography was prepared by the National Career Information Center of the American Personnel and Guidance Association, 1607 New Hampshire Avenue, NW, Washington, DC 20009, (1976)

CAREERS IN AEROSPACE AND RELATED FIELDS

A Listing of Information Sources

Prepared by the National Career Information Center of the National Counseling and Development Association in cooperation with the National Aeronautics and Space Administration.

TRADE, PROFESSIONAL AND EDUCATIONAL SOURCES

AEROSPACE AND AVIATION

A Giant Leap for Womankind, Too, National Geographic Society, 17th and M Streets, NW, Washington, DC 20036, (1973) 10¢

Airport Management - A Profession, American Association of Airport Executives, 2029 K Street, NW, Washington, DC 20006, (1971)

Airworthy - A Career as an A&P Mechanic, General Aviation Manufacturers Association, Suite 1200-A, 1025 Connecticut Avenue, NW, Washington, DC 20036, (1971)

ALPA Occupational Guides, Airline Pilots Association, 1329 E Street, NW, Washington, DC 20004 (1971)

Aviation Education Materials, General Aviation Manufacturers Association, Suite 1200-A, 1205 Connecticut Avenue, NW, Washington, DC 20036, (1972)

Careers in Aerospace, American Institute of Aeronautics and Astronautics, 1290 Avenue of the Americas, New York, NY 10019, (1971)

Careers in Aerospace Medicine and Life Sciences, The Aerospace Medical Association, Washington National Airport, Washington, DC 20001, (1970)

Flight Engineer - Fact Sheet, Flight Engineers' International Association, 905 16th Street, NW, Washington, DC 20006, (1971)

Going Up!...A Career as a Professional Pilot, General Aviation Manufacturers Association, Suite 1200-A, 1025 Connecticut Avenue, NW, Washington, DC 20036, (1971)

Help-Mate...A Career Using Personal Flying, General Aviation Manufacturers Association, Suite 1200-A, 1025 Connecticut Avenue, NW, Washington, DC 20036, (1971)

Mr. Aviation...A Career as a Fixed Base Operator, General Aviation Manufacturers Association, Suite 1200-A, 1025 Connecticut Avenue, NW, Washington, DC 20036, (1971)

Sky-School...A Career as a Flight Instructor, General Aviation Manufacturers Association, Suite 1200-A, 1025 Connecticut Avenue, NW, Washington, DC 20036, (1971)

The People of the Airlines, Air Transport Association of America, 1709 New York Avenue, NW, Washington, DC 20006, (1973) The World of Agricultural Aviation, National Agricultural Aviation Association, Suite 808, 1101 17th Street, NW, Washington, DC 20036, (1972)

Transport Career Opportunities, National Defense Transportation Association, 1612 K Street, NW, Washington, DC 20006, (1972), $5

ENGINEERING

Biomedical Engineering Education Summary Directory 1971, Biomedical Engineering Directory, AIBS/BIAC, 3900 Wisconsin Avenue, NW, Washington, DC 20026, (1971)

Career Guidance Reprints, Society of Women Engineers, 345 East 47th Street, New York, NY 10017, (Dates vary)

Careers in Photographic Science and Engineering, Society of Photographic Scientists and Engineers, 1330 Massachusetts Avenue, NW, Washington, DC 20005, (1973)

Chemical & Engineering News: Career Opportunities for Chemists, Employment Outlook '73, American Chemical Society, 1155 16th Street, NW, Washington, DC 20036, Represent 10.272, $1, (1972)

Chemical Engineering and You..., American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017, (1970)

Consulting Engineering...A Career With a Future, Consulting Engineers Council of the USA, 1155 15th Street, NW, Washington, DC 20005, (1971)

Engineering: A Career of Dedication and Responsibility, National Society of Professional Engineers, 2029 K Street, NW, Washington, DC 20006, (1974)

Engineering Guidance and Counseling, American Society for Engineering Education, One Dupont Circle, Suite 400, Washington, DC 20036, $2.50, (1972)

Engineering Technician, American Society for Engineering Education, One Dupont Circle, Suite 400, Washington, DC 20036, 50¢, (1971)

This bibliography for guidance workers has been designed to identify a variety of information sources in aerospace and related fields. The field of aerospace touches more than aeronautics and space; the number of scientific, engineering, and technical occupations that are related to this field are worth exploring.

Since young people exploring their futures may have questions about the field of aerospace, guidance workers are urged to acquire the materials listed in this bibliography. They will provide much of the information needed during the exploration phase of career decision making. In four separate sections – Trade, Professional and Educational Sources, Government Sources, Publishers, and Business and Industrial Sources, this guide lists more than 150 occupational and educational materials.

SPACE TRANSPORTATION

SUGGESTED REFERENCES

Annual Report to Congress. Washington, DC: NASA, 1969 to present.
Beals, D.D. and Corliss, W.R. Wind Tunnels of NASA. Washington, DC: NASA, 1981.
Branley, F.M. Space Colony: Frontier of the 21st Century, Lodestar Books, 1982.
Clarke, D. (Ed.) The Encyclopedia of Transportation, London: Marshall Cavendish, Pub., 1976.
Coyle, J.J., Bardi, E.J., and Cavinato, J.L. Transportation, St. Paul, MN: West Publishing Co., 1982.
Dalton, D. The Miracle of Flight, NY: McGraw-Hill, 1977.
DeVore, P. (Ed.) Introduction to Transportation, Worcester, MA: Davis Publications, 1983.
Kaufmann, J. Fly-It, Garden City, NY: Doubleday and Co., 1980.
Nicolson, I. Sputnik to Space Shuttle: The Complete Story of Space Flight, Dodd Pub., 1983.
Ninomiya, Y. Whitewings, (Paper airplane kit and manual.) Osaka, Japan: AG Inc., 1980.
Numeroff, W.T. and Cipriano, A.T. America's Journey into Space: The Astronauts of the United States, Messner Pub., 1979.
Space Travel and Colonies (Ripley's Believe It or Not series). Putnam Pub. Group, 1982.
de Ste. Croix, P. (Ed.) Space Technology, NY: Crown Publishers, 1981.
Stine, H.G. Handbook of Model Rocketry, Chicago: Follett Pub. Co., 1976.
Time-Life Books, This Fabulous Century (Vol. VII, 1960-1970). NY: Time Inc., 1970.

The following references are available from the United States Government Printing Office, Room 1365, Federal Building, 219 S. Dearborn Street, Chicago, IL 60604, (312) 353-5133. The costs are based on 1983 prices:

Aboard the Space Shuttle. 1980, S/N 033-000-0086-6, $2.75.
A Meeting with the Universe. 1982, S/N 033-000-00836-8, $14.00.
Apollo. 1974, S/N 033-000-00553-9, $4.75.
ERTS1: A New Window On Our Planet. 1976, S/N 024-001-027 57-7, $15.00.
Food for Space Flight. 1982, S/N 033-000-00851-1, $2.25.
The Next Step: Large Space Structures. 1982, S/N 033-000-00853-8, $2.00.
Occupational Outlook Handbook (present year). S/N 029-001-02651-0, $9.00.
Plantery Exploration Through Year 2000. 1983, S/N 033-000-00871-6, $5.50.
Prelude to the Space Age: The Rocket Societies: 1924-1940, 1983, S/N 047-000-00380-6, $6.50.
Shuttle Lithographs (4 8x10). 1981, S/N 033-000-00833-3, $3.75.
Spacelab 1. 1982, S/N 033-000-00846-5, $4.00.
Space Settlements: A Design Study 1977, S/N 033-000-00660-1, $10.00.
The Space Shuttle at Work. 1977, S/N 033-000-00779-5, $5.00.
Ten Years of Planetary Exploration (posters). 1983, S/N 033-000-00861-9, $4.50.
The Voyager Flights to Jupiter and Saturn. S/N 033-000-00854-6, $5.50.

AUDIO VISUALS

The following films are available on a free loan from the NASA Lewis Research Center, Office of Educational Services, 21000 Brookpark Road, Cleveland, OH 44135, (216) 433-4000, Ext. 708. Please order films at least 45 days in advance. A NASA films brochure listing additional films is available.

We encourage students to seek the professional assistance of their counselors and personal assistance of people who work in aerospace careers. Exploring the world of aerospace careers will be informative and exciting.

Francis E. Burtnett, Director
National Career Information Center
American Personnel and Guidance Association
Washington, DC 20009
March, 1976

EQUIPMENT LISTS

Industrial Technology Education Equipment List
Middle/Junior High School
November 1, 1988

This equipment list is the recommended equipment guide for the program of study listed above.

When a school district requests approval of equipment, the items requested should come from this list. All equipment must meet Occupational Safety and Health Act Regulations. All machines should have 110 voltage controls.

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Construction Technology		
1	2	Sight Level Package	Level instrument, tripod w/adjustable legs and sighting rods.	280.00	560.00
2	1	Tool Kit, Plumbing	Kit includes one each of the following: Metal Tool Box 14" Pipe Wrench Plastic Tube Cutter Strap Wrench 8" Adjustable Wrench 7 pc. Screwdriver Set 10" Tongue and Groove Plier 8" Combination Plier 10" English/Metric Tape Expansion Bit 16 oz. Claw Hammer Rubber Mallet Copper Tube Cutter	230.00	230.00
3	1	Tool Kit, Bricklayer	Kit includes one each of the following: 6" Spacing Rule Tool Bag 48" Level Brick Hammer 3/8"x1/2" Jointer 5 1/2" Pointing Trowel Yellow Line 250' Corner Block 3" Brick Set 5/8"x3/4" Jointer 11" Narrow Heal London Trowel with Wood Handle	140.00	140.00

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Construction Technology		
4	1	Tool Kit, Building Trade	Kit includes one each of the following: Tool Box 19"x8"x8" 16 oz. Claw Hammer 10-12" Hack Saw 13 pc. Drill Bit Set 10" Adjustable Wrench 8 pc. Hexkey Set 6" Lineman's Plier 6" Combination Plier 12" Pipe Wrench 3" Standard Screwdriver 3" Phillip Screwdriver Cement Jointer Tool Electrician's Knife Plumber's Strap Wrench 9" Level 10" Vise Grip Plier 20" Measuring Tape 6" Needle Nose Plier Tubing Cutter 1/8"-3/4" Wire Cutter/Stripper 6" Standard Screwdriver 4" Phillip Screwdriver	230.00	230.00
5	2	Tool Kit, Carpentry	Kit includes one each of the following: Carpenter's Metal Chest 16 oz. Ripping Hammer 10" Dovetail Saw 10" Wrecking Bar 10" Bit Brace 10" Channelock Plier 9" Smooth Plane 24" Aluminum Level 6" Combination Plier 26" 5½ Point Rip Saw 13 pc. Auger Drill Bit Set 10" Metric/English Tape 6' English/Metric Folding Rule 7 pc. Standard Screwdriver Set 4 pc. Phillips Screwdriver Set 12" Metric/English Combo Square Wood Chisel Set 1/4" thru 1 1/2" 26" 8-point Crosscut Saw 10" Keyhole Saw File Type Surform	325.00	750.00

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Construction Technology		
6	1	Tool Kit, Electricity	Kit includes one each of the following: Metal Tool Box 7 pc. Screwdriver Set B-X Armor Cutter Electrician's Knife 7" Side Cutting Plier 6" Needle Nose Plier Continuity Tester 8" Combination Plier Crimper-Cutter/Bolt Slicer 6" Adjustable Wrench Fuse Puller Cable Ripper Conduit Benders (2)	180.00	180.00
7	1	Miter Box	28"x5", 11 point backsaw 30 to 60 angle capacity	200.00	200.00
			Total $2,190.00 **5% Sales Tax** 109.50 **Grand Total** $2,229.50		
			Communication Technology		
8	2	Camera	35 mm SLR camera with electronic flash attachment, variable F-stop and shutter speed and lens shade.	250.00	500.00
9	1	Drymount Press	Thermostatic temperature control, 12"x15"	400.00	400.00
10	1	Paper Cutter	24"x24' with guard	160.00	160.00
11	1	Computer Aided Drafting System	Introductry CAD system, should include a computer with dual disk drive, high resolution monitor, mouse pointing devise and pen plotter. Turn Key Operation.	3,000.00	3,000.00

* Recommended for middle-junior high schools.

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ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Communication Technology		
12	1	Darkroom Kit	Kit includes the following: Twin girder enlarger with capacity for negatives up to $2\frac{1}{4}$x$3\frac{1}{4}$ 1 16 oz. funnel 1 enlarger dodging kit 1 12" paper trimmer with/guide 1 8" x 10" paper safe 1 enlarger focusing device 1 film changing bag 2 35mm plastic film developing reels 1 darkroom enlarging timer 3 development trays 1 adjustable easel 1 dial thermometer 1 darkroom safelight 10"x12" 1 paper dryer 1 50 mm enlarger lens 1 negative carrier-35mm 3 print tongs 1 35mm developing tank that holds 2 reels	1,100.00	1,100.00
13	1	Silk Screening Kit	Complete 12" x 18" printing unit with frame.	220.00	220.00
14	1	Developing Sink	Standard developing sink, includes a mixing faucet, spray hose, stand and drain	900.00	900.00
15	1	Laser Training System	Should include complete laboratory package for teaching the transmission of sound and light. Laboratory package should include assembled modulated with tripod, mirrors, lenses, filter, and mounts.	600.00	600.00

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Communication Technology		
16	1	VCR Package	To include fullsize camcorder, stand, fluidhead tripod and audio dubbing and 19" monitor receiver with audio and video jacks, wireless microphone and video editor.	2,350.00	2,350.00
17	1	Stereo Mixer	Stereo mixer with inputs for microphones, tapes and turntables.	150.00	150.00
18	3	Electronic/Electricity Trainer	Exploratory electronics-electricity laboratory that should include voltmeter, AC/DC power supply, meter package, switches, lamps, resistors and rheostats, buzzers, bell units and other components to teach basic electronics and electricity. Includes (3) electronics tool kits with soldering tool and tips, 4" needle nose pliers, nut driver set, slotted screwdriver phillip head screwdriver, and tool box. * Recommended for middle-junior high schools.	650.00	1,950.00
19	1	Oscilloscope	20 mHz dual trace triggered scope to include 2x10 probes	500.00	500.00
20	10	Drafting Machine	Standard drafting machine with automatic indexing device. To include scales and should be compatable with drafting tables.	200.00	2,000.00
21	10	Table, Drafting	24"Dx36"W or 30"Dx42"W overall top demensions.	275.00	2,750.00

Total	$16,580.00
5% Sales Tax	829.00
Grand Total	$17,409.00

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Energy, Power and Transportation Technology		
22	1	Air Compressor	20 gallon ASME tank, 1½ HP, 110 v motor	500.00	500.00
23	1	Energy-Power Research Center	To include a solar test box unit, solar collector with radiation meter and unit to analyze the sun's position, solar powered engine test unit and wind power test unit. * Recommended for middle and junior high school	2,000.00	2,000.00
24	1	Power Technology Learning Station	The power mechanics bench will have 2 work stations to accomodate 2-3 students at each station. Work bench should include bench w/center pedestal; includes riser and manifold, single-door storage compartment and one drawer, bench exhaust system with 1/2HP motor, single phase, 110V, totally enclosed fan cooled. Ignition test analyzer to test conventional and transistor ignition systems, conventional magnets and battery coils and condensors found on small gasoline engine. 1-small engine dynamometer that has a self contained load and read out system and can test horizontal and vertical crankshaft engines. 1-parts cleaner with immersion chamber, 15-17 gallon soak tank.	6,200.00	6,200.00

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST

Energy, Power, and Transportation Technology

The following tools and equipment:

1 spark plug tester
3 plug gauges
2 reamers
1 bushing driver
1 bushing reamer
2 jet screwdrivers
1 oil plunger reamer
1 driver
1 feeler gauge
2 flywheel pullers
2 piston ring compressors
1 clutch wrench
1 flywheel holder
1 7 pc. screwdriver set
1 pipe wrench
1 1-1/8" socket, 1/2"
1 13/16" socket, 3/8"
1 service manual
1 training manual
1 compression tester
1 swivel base vise
1 torque wrench
1 brass hammer
1 adapter 3/8" to 1/2"
1 8" phillips screwdriver
1 8" screwdriver
1 9-1/2" all purpose pliers
1 6" mechanics wrench
2 valve spring compressor
2 ignition files 5 1/4"
1 7 pc. spark plug gapping tool
1 allen wrench set 19 pc.
1 socket driver
1 1/4" drive socket set 1/4" thru 1/2"
1 16 pc. socket set 3/8" drive
1 1" socket, 1/2" drive
12 comb. wrenches
1 4 oz. ball pein hammer
1 small engine tachometer
2-4 cycle engines or
1-2 cycle engine and
1-4 cycle engine

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Energy, Power, and Transportation Technology		
25	1	Raceway	Should include interface box, cables, slammer arm catch and raceway.	500.00	500.00
26	1	Fluid Power Trainer Module	A unit that is capable of teaching both hydraulic and pneumatic principles. Should include in the pneumatic power unit all cylinders, valves, controls, tubing quick connectors and components. The pneumatic power should contain built in compressor, pressure regulator and storage tank.	1,000.00	1,000.00
27	1	Mechanical Power Trainer	Module should include basic mechanical devices, toggle linkage gear trains, wormgears, and pulleys needed to teach the fundamentals of transmissions and control of power.	1,375.00	1,375.00
28	1	Transporation Technology Trainer	A fully operational vehicle that has independent front suspension, rack and pinion steering, hydraulic disc brakes, engine, torque converter and planetary differential. Turn Key Operation.	3,000.00	3,000.00

Total	**$14,575.00**
5% Sales Tax	728.75
Grand Total	**$15,303.75**

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Manufacturing Technology		
29	1	Drill, Portable	3/8" HD, 3-5 amps VRS.	150.00	150.00
30	5	Kits, Robot	Robots that respond both to sound and solid objects. Kits should teach the fundamentals of robotics and robot sensors.	50.00	250.00
31	1	Safety Glasses	Steel reinforced cabinet designed to store and sanitize safety glasses and goggles. Should include 28 safety glasses and 6 goggles.	500.00	500.00
32	1	Sander Vibrating	HD instant-release trigger switch with locking button.	175.00	175.00
33	1	CNC Training Lathe	Computer and numerical control lathe with safety shield. The system shall use conventional CNC codes including linear and circular interpulation. Should include mouse and CAD/CAM Kit, Machinist Kit Computer with color monitor to operate system. Turn key operation. To include a precision measurement tool set with 0-1" micrometer, combination square with centerhead, center gauge, center punch, 6" flexible rule, 4" divider, 4" outside caliper, 4" inside caliper, 4" hermaphrodite caliper, steel dial vernier caliper, dial indicator with .250 range and magnetic base, to include protective case.	6,900.00	6,900.00

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ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Manufacturing Technology		
34	1	CNC Milling Center	Computer and numerical control mill with safety shield. Complete with X,Y,Z control tooling mechanism, milling machinist and engraver kit, computer with color monitor to operate system. Turn key operation. To include a precision measurement tool set with 0-1" micrometer, combination square with centerhead, center gauge, center punch, 6" flexible rule, 4" dividers, 4" outside caliper, 4" outside caliper, 4" inside caplier, 4" hermaphrodite caliper, steel dial vernier caliper, dial indicator with .250 range and magnetic base, to include protective case.	7,200.00	7,200.00
35	1	Computer Intergrated Materials Handling Workcell	The workcell is to include 3 robotic arms, 3 teach pendants, 1 computer controlled linear slide base, 1 computer controlled conveyour belt 1 computer controlled rotary carousel, 1 controller system, 3 gravity feeders and all necessary sensors, cables and power supplies. I host computer to integrate with the workcell. This workcell allows for the establishment of 3 separate work stations to teach the basic concepts of robotics as well as to operate as a complete intergrated workcell. Turn key operation.	12,500.00	12,500.00

* Recommended for middle-junior high schools.

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Manufacturing Technology		
36	1	Plastic Technology Learning Station	Includes manual injection molder,2/3 oz. shot capacity, 600 watt heater with 100-600 F temperature range, vacuum former with a 1 HP vacuum motor and kit, plastic strip heater 34" length, rotational molder and kit, and a heat gun with 750-1000 F temperature range.	3,800.00	3,800.00
37	1	Welder, Spot	220 v, 1/8 mild steel capacity, 1.5 KVA, to include pedestal, timer, tongs and tips.	725.00	725.00

Total	$32,200.00
5% Sales Tax	1,610.00
Grand Total	$33,810.00

Grand Total for Industrial Technology Education Middle Jr. High **$68,822.25**

Industrial Technology Education Equipment List
High Schools
November 1, 1988

This equipment list is the recommended equipment guide for the program of study listed above.

When a school district requests approval of equipment, the items requested should come from this list. All equipment must meet Occupational Safety and Health Act Regulations. All machines should have 110 voltage controls.

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Construction Technology		
1	2	Sight Level Package	Level instrument, tripod w/adjustable legs and sighting rods.	280.00	560.00
2	1	Tool Kit, Plumbing	Kit includes one each of the following: Metal Tool Box 14" Pipe Wrench Plastic Tube Cutter Strap Wrench 8" Adjustable Wrench 7 pc. Screwdriver Set 10" Tongue and Groove Plier 8" Combination Plier 10" English/Metric Tape Expansion Bit 16 oz. Claw Hammer Rubber Mallet Copper Tube Cutter	230.00	230.00
3	1	Tool Kit, Bricklayer	Kit includes one each of the following: 6" Spacing Rule Tool Bag 48" Level Brick Hammer 3/8"x1/2" Jointer 5½" Pointing Trowel Yellow Line 250' Corner Block 3" Brick Set 5/8"x3/4" Jointer 11" Narrow Heal London Trowel with Wood Handle	140.00	140.00

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ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Construction Technology		
4	1	Tool Kit, Building Trade	Kit includes one each of the following: Tool Box 19"x8"x8" 16 oz. Claw Hammer 10-12" Hack Saw 13 pc. Drill Bit Set 10" Adjustable Wrench 8 pc. Hexkey Set 6" Lineman's Plier 6" Combination Plier 12" Pipe Wrench 3" Standard Screwdriver 3" Phillip Screwdriver Cement Jointer Tool Electrician's Knife Plumber's Strap Wrench 9" Level 10" Vise Grip Plier 20" Measuring Tape 6" Needle Nose Plier Tubing Cutter 1/8"-3/4" Wire Cutter/Stripper 6" Standard Screwdriver 4" Phillip Screwdriver	230.00	230.00
5	2	Tool Kit, Carpentry	Kit includes one each of the following: Carpenter's Metal Chest 16 oz. Ripping Hammer 10" Dovetail Saw 10" Wrecking Bar 10" Bit Brace 10" Channelock Plier 9" Smooth Plane 24" Aluminum Level 6" Combination Plier 26" 5½ Point Rip Saw 13 pc. Auger Drill Bit Set 10" Metric/English Tape 6' English/Metric Folding Rule 7 pc. Standard Screwdriver Set 4 pc. Phillips Screwdriver Set 12" Metric/English Combo Square Wood Chisel Set 1/4" thru 1 1/2" 26" 8-point Crosscut Saw 10" Keyhole Saw File Type Surform	325.00	650.00

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Construction Technology		
6	1	Tool Kit, Electricity	Kit includes one each of the following: Metal Tool Box 7 pc. Screwdriver Set B-X Armor Cutter Electrician's Knife 7" Side Cutting Plier 6" Needle Nose Plier Continuity Tester 8" Combination Plier Crimper-Cutter/Bolt Slicer 6" Adjustable Wrench Fuse Puller Cable Ripper Conduit Benders (2)	180.00	180.00
7	1	Miter Box	28"x5", 11 point backsaw with 30 to 60 angle capacity	200.00	200.00
			Total $2,190.00 **5% Sales Tax** 109.50 **Grand Total** $2,299.50		
			Communication Technology		
8	2	Camera	35 mm SLR camera with electronic flash attachment, variable F-stop and shutter speed and lens shade.	250.00	500.00
9	1	Drymount Press	Thermostatic temperature control, 12"x15"	400.00	400.00
10	1	Paper Cutter	24"x24' with guard	160.00	160.00

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Communication Technology		
11	1	Computer Aided Drafting System	Should include computer with dual disk drive or one floppy disk and one hard drive, color monitor, mouse pointing device, size A-B 6 or 8 pen flatbed plotter and cables. Thurn Key Operation. * Recommended for high schools	4,300.00	4,300.00
12	1	Darkroom Kit	Kit includes the following: Twin girder enlarger with capacity for negatives up to $2\frac{1}{4}x3\frac{1}{4}$ 1 16 oz. funnel 1 enlarger dodging kit 1 12" paper trimmer with/guide 1 8" x 10" paper safe 1 enlarger focusing device 1 film changing bag 2 35mm plastic film developing reels 1 darkroom enlarging timer 3 developing trays 1 adjustable easel 1 dial thermometer 1 darkroom safelight 10"x12" 1 paper print dryer 1 50mm enlarger lens 1 negative carrier-35mm 3 print tongs 1 35mm developing tank that holds 2 reels	1,100.00	1,100.00
13	1	Silk Screening Kit	Complete 12" x 18" printing unit with frame.	220.00	220.00
14	1	Developing Sink	Standard developing sink, includes a mixing faucet, spray hose, stand and drain.	900.00	900.00
15	1	Laser Training System	Should include complete laboratory package for teaching the transmission of sound and light. Laboratory package should include assembled modulated with tripod, mirrors, lenses, filter, and mounts.	600.00	600.00

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Communication Technology		
16	1	VCR Package	To include fullsize camcorder, stand, fluidhead tripod and audio dubbing 19" and monitor receiver with audio and video jacks, wireless microphone and video editor.	2,350.00	2,350.00
17	1	Stereo Mixer	Stereo mixer with inputs for microphones, tapes and turntables.	150.00	150.00
18	2	Electronic/Electricity Trainer	Comprehensive electronics/electricity training system to include laboratory instrument system consisting of a sine/square generator, electronic VOM, AC/DC power supply-D/C meters. Should be designed to teach the fundamentals of AC/DC, electronics, electricity, motor and generators. Includes 2 electronics tool kits, with soldering tool, tips, 4" needle nose pliers, ¼" nut driver set, slotted screwdriver, phillip head screwdriver, and tool box. * Recommended for high schools.	1,675.00	3,350.00
19	1	Oscilloscope	20 mHz dual trace triggered scope to include 2x10 probes	500.00	500.00
20	10	Drafting Machine	Standard drafting machine with automatic indexing device. To include scales and should be compatable with drafting tables.	200.00	2,000.00
21	10	Table, Drafting	24"Dx36"W or 30"Dx42"W overall top demensions.	275.00	2,750.00

Total	**$19,280.00**
5% Sales Tax	**964.00**
Grand Total	**$20,244.00**

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ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Energy, Power and Transportation Technology		
22	1	Air Compressor	20 gallon ASMF tank, 1½ HP, 110 v motor	500.00	500.00
23	1	Trainer, Solar Energy	With self-contained cart. Solar collectors should be detachable. Control panel should consist of two flow meters, two flow control valves, and electronic thermometer. * Recommended for high schools	2,000.00	2,000.00
24	1	Power Technology Learning Station	The power mechanics bench will have 2 work stations to accomodate 2-3 students at each station. Work bench should include bench w/center pedestal; includes riser and manifold, single-door storage compartment and one drawer, bench exhaust system with 1/2HP motor, single phase, 110V, totally enclosed fan cooled. Ignition test analyzer to test conventional and transistor ignition systems, conventional magnets and battery coils and condensors found on small gasoline engine. 1-small engine dynamometer that has a self contained load and read out system and can test horizontal and vertical crankshaft engines. 1-parts cleaner with immersion chamber, 15-17 gallon soak tank.	6,200.00	6,200.00

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST

Energy, Power, and Transportation Technology

The following tools and equipment:

1 spark plug tester
3 plug gauges
2 reamers
1 bushing driver
1 bushing reamer
2 jet screwdrivers
1 oil plunger reamer
1 driver
1 feeler gauge
2 flywheel pullers
2 piston ring compressors
1 clutch wrench
1 flywheel holder
1 7 pc. screwdriver set
1 pipe wrench
1 1-1/8" socket, 1/2"
1 13/16" socket, 3/8"
1 service manual
1 training manual
1 compression tester
1 swivel base vise
1 torque wrench
1 brass hammer
1 adapter 3/8" to 1/2"
1 8" phillips screwdriver
1 8" screwdriver
1 9-1/2" all purpose pliers
1 6" mechanics wrench
2 valve spring compressor
2 ignition files 5 1/4"
1 7 pc. spark plug gapping tool
1 allen wrench set 19 pc.
1 socket driver
1 1/4" drive socket set 1/4" thru 1/2"
1 16 pc. socket set 3/8" drive
1 1" socket, 1/2" drive
12 comb. wrenches
1 4 oz. ball pein hammer
1 small engine tachometer
2 4 cycle engines or
1 2 cycle engine and
1 4 cycle engine

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Energy, Power, and Transportation Technology		
25	1	Raceway	Should include interface box, cables, slammer arm catch and raceway.	500.00	500.00
26	1	Fluid Power Trainer Module	A unit that is capable of teaching both hydraulic and pneumatic principles. Should include in the pneumatic power unit all cylinders, valves, controls, tubing quick connectors and components. The pneumatic power should contain built in compressor, pressure regulator and storage tank.	1,000.00	1,000.00
27	1	Mechanical Power Trainer	Module should include basic mechanical devices, toggle linkage gear trains, wormgears, and pulleys needed to teach the fundamentals of transmissions and control of power.	1,375.00	1,375.00
28	1	Transportation Technology Trainer	A fully operational vehicle that has independent front suspension, rack and pinion steering, hydraulic disk brakes, engine, torque converter and planetary differential. Turn Key Operation.	3,000.00	3,000.00

Total	**$14,575.00**
5% Sales Tax	**728.75**
Grand Total	**$15,303.75**

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Manufacturing Technology		
29	1	Drill, Portable	3/8" HD, 3-5 amps VRS.	150.00	150.00
30	5	Kits, Robot	Robots that respond both to sound and solid objects. Kits should teach the fundamentals of robotics and robot sensors.	50.00	250.00
31	1	Safety Glasses	Steel reinforced cabinet designed to store and sanitize safety glasses and goggles. Should include 28 safety glasses and 6 goggles.	500.00	500.00
32	1	Sander Vibrating	HD instant-release trigger switch with locking button.	175.00	175.00
33	1	CNC Training Lathe	Computer and numerical control lathe with safety shield. The system shall use conventional CNC codes including linear and circular interpulation. Should include mouse and CAD/CAM Kit, Machinist Kit, Computer with color monitor to operate system. Turn key operation. To include a precision measurement tool set with 0-1" micrometer, combination square with centerhead, center gauge, center punch, 6" flexible rule, 4" divider, 4" outside caliper, 4" inside caliper, 4" hermaphrodite caliper, steel dial vernier caliper, dial indicator with .250 range and magnetic base, to include protective case.	6,900.00	6,900.00

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Manufacturing Technology		
34	1	CNC Milling Center	Computer and numerical control mill with safety shield. Complete with X,Y,Z control tooling mechanism, milling machinist and engraver kit, computer with color monitor to operate system. Turn key operation. To include a precision measurement tool set with 0-1" micrometer, combination square with centerhead, center gauge, center punch, 6" flexible rule, 4" dividers, 4" outside caliper, 4" outside caliper, 4" inside caplier, 4" hermaphrodite caliper, steel dial vernier caliper, dial indicator with .250 range and magnetic base, to include protective case.	7,200.00	7,200.00
35	1	Computer Intergrated Material Handling Workcell	The workcell is to include 2 robotic arms with teach pendants, 1 SCARA robot arm with teach pendant, program controllers to interface with arms as needed, 1 rotary carousel, 2 conveyor belts, 1 linear slide base, to be operated by a controller or computer. 1 host computer, cables, sensors and power supplies that will intergrate with the workcell. This workcell can be used as a total intergrated system or 3 separate work stations. Turn key operation. * Recommended for high schools.	27,000.00	27,000.00

ITEM NO.	QUANTITY	ITEM	SPECIFICATIONS	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
			Manufacturing Technology		
36	1	Plastic Technology Learning Station	Includes manual injection molder, 2/3 oz. shot capacity, 600 watt heater with 100-600 F temperature range, vacuum former with a 1 HP vacuum motor and kit, plastic strip heater 34" length, rotational molder and kit, and a heat gun with 750-1000 F temperature range.	3,800.00	3,800.00
37	1	Welder, Spot	220 v, 1/8 mild steel capacity, 1.5 KVA, to include pedestal, timer, tongs and tips.	725.00	725.00

Total	**$46,700.00**
5% Sales Tax	**2,335.00**
Grand Total	**$49,035.00**

Grand Total for Industrial Technology Education High Schools	**$86,882.25**